

**LS8000 LEVEL SWITCH  
OWNERS MANUAL**

- ◆ **INSTALLATION**
- ◆ **CALIBRATION**
- ◆ **TROUBLESHOOTING**
- ◆ **WARRANTY**

**NOTICE**

This manual contains important information necessary for the proper operation of this product. Before installing the unit, please read these instructions and familiarize yourself with the requirements and functions of this device.

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If any questions or problems arise during installation, please contact

**Customer Service:** 1-800-835-8012 or 713-467-4438 (8:00 a.m. to 5:00 p.m. CST US)



**WARNING**

Failure to follow safe installation and servicing guidelines could result in death or serious injury.

- Make sure only qualified personnel perform the installation.
- Use the equipment only as specified in this manual. Failure to do so may impair the protection provided by the equipment.
- Do not perform any services other than those contained in this manual unless you are qualified.
- Verify the operating environment of the Babbitt LS8000 is consistent with the appropriate area classification.

Improper use or installation of this device may cause the following:

- Personal injury or harm.
- Application hazards such as overflow or overflows.
- Damage to the device or system.

High voltage that may be present on leads could cause electrical shock.

- Make sure the main power to the Babbitt LS8000 level switch is off and the lines to any other external power source are disconnected or not powered while wiring the instrument.



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**LS8000 LEVEL SWITCH****1. DESCRIPTION****1.1 General Description**

The LS8000 is an adjustable, radio frequency impedance sensing device, which can be used to detect the presence or absence of material in a pipe. The basic unit is made up of a solid stainless-steel probe attached to an explosion proof housing. Inside the explosion proof housing is a transmitter that is connected to the receiver board by a twisted, shielded pair of wires. The receiver board may be mounted up to one mile from the probe. All calibration adjustments and indicators are at the receiver. The receiver also has the relay output and an on-board fuse. The unit is calibrated in the absence of material and an on-board relay at the receiver changes state when material is detected.

**1.2 Specifications****Electrical**

Power:	115 VAC ( $\pm 15\%$ ) 50/60 Hz. 2 watts, standard. (12 VDC, 24 VDC or 230 VAC optional)
Output:	2 Form C contacts, DPDT relay, 5 amp resistive at 125, 250 VAC; 30 VDC
Fuse:	On board, 250 mA @ 125 volts
Fail Safe:	Selectable high or low level
Time Delay:	Selectable: ON or OFF delay Adjustable: 1/8 sec to 2 hours
RF Frequency:	Approximately 1.3 MHz

**Environmental**

Enclosure:	Transmitter:	Cast Aluminum; Class I, Groups C & D; Class II, Groups E, F & G
	Receiver:	Open printed circuit board can be put in enclosure as required by application.
Temperature:	Probe: -30° F to 450° F** Electronics: -40° F to 185° F	
Pressure:	Probe: 300 PSI @ 75° F** (**Higher ranges available upon request)	
Construction:	Probe: All wetted parts, 316 SS Teflon and Viton. Transmitter: Housed in cast aluminum explosion proof enclosure Receiver: Printed circuit board mounted on plastic track provided with each unit.	

**Specifications subject to change without notice.**

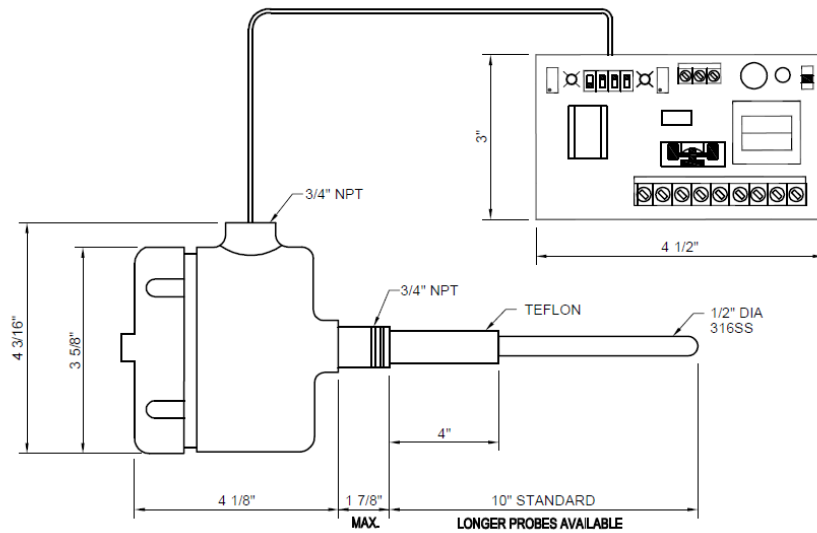
### 1.3 Ordering Information

Model	Supply Voltage	Probe Material	Probe Length (Inches)	Additional Options
LS8000	115VAC	S	10"	X
	115VAC 24VDC 220VAC 12VDC			
	S-316SS C-Cable Probe H-HALAR T-TEFLON SLEEVE			
	Rigid Probes 4" to 144" Cable Probes 10" to 420" TEFLON Sleeve Probes 10" to 144"			
	Flange (Specify Size & Rating) 1.5" TC – Tri-Clamp Connection 2" TC – Tri-Clamp Connection XSP-Extra Static Protection (Plastics) N4E – NEMA 4X Enclosure for Remote Electronics GRE – GRE Explosion Proof Enclosure for Remote Electronics			

Example P/N: LS8000-24VDC-S-12" or LS8000-115VAC-H-10"-2" 150# Flange

**Special materials of construction are available – consult factory.**

### 1.4 GA Drawing



## 2. THEORY OF OPERATION

The LS8000 employs a radio frequency (RF) balanced impedance bridge circuit to detect if the probe is in contact with the material that is to be sensed. When material is not in contact with the probe, the bridge is balanced by turning the adjustment pot to find the threshold where the red led goes out. When material is in contact with the probe, the bridge becomes unbalanced and the comparing circuit realizes the change. This causes the relay to change state.

## 3. INSTALLATION

**CAUTION:** ALL INSTALLATION AND WIRING MUST CONFORM TO NEC AND ALL OTHER LOCAL ELECTRICAL CODES. TAKE SPECIAL CARE IN OBSERVING HAZARDOUS AREA SAFETY PROCEDURES. WE ASSUME NO LIABILITY FOR IMPROPERLY INSTALLED OR WIRED UNITS.

### 3.1 Inspection

Carefully unpack the LS8000 from the shipping box and check each item against the packing list before destroying any packing material. Visually inspect for any damage that may have occurred during shipping. Please advise the factory or your local distributor of any damage.

A complete unit should consist of the following:

1. An explosion proof enclosure with probe attached
2. A transmitter module inside of the explosion proof enclosure
3. The LS8000/R receiver card
4. A plastic snap track to mount the receiver card

### 3.2 Physical Installation

- 1) The LS8000 is installed into the vessel wall using a 3/4" NPT process connection. This can be either a threaded coupling or a tapped entry such as a flange.
- 2) The insulator should always extend at least 2" through the vessel wall.
- 3) Always check for physical room around the location you have chosen to allow for installation. Allow 2 3/4" turning radius to screw the probe in and clearance above for the length of the probe.
- 4) **CAUTION:** Always take the necessary safety precautions when cutting or welding in the coupling for the LS8000.
  - a) Tag and lock out the electrical power to the equipment that services the vessels.
  - b) Check liquid or dry powders that create a gas in the vessel for oxygen as well as the explosion factor. (All dust will explode.)
  - c) Vessels that are cross vented have to be isolated.
- 5) Screw the LS8000 into the connection provided. In dry material applications, no sealant on the threads is required. On liquid applications, Teflon or a good pipe thread sealant may be used.

- 6) The LS8000 has a  $\frac{3}{4}$ " conduit entry. When wiring these units, conform to the National Electrical Code and any other city or company codes.
- 7) Always install the electrical connection into the  $\frac{3}{4}$ " conduit entry on the LS8000 so water will not follow the connection routing into the threads of the conduit hub. To guarantee that condensation and water will stay outside the unit, install an EYSM unilet before each LS8000 and fill with explosion proof sealing cement.
- 8) When required, the LS8000 probe can be bent to meet your special application. Remember to allow 2" of clearance between the probe and the vessel wall. If the probe is to be used in a pressure application, the factory must bend the probe to your specifications.
- 9) Location of probes on high level installations is more critical on dry materials than liquids. Note the following:
  - a) For dry materials, mount the LS8000 in the top of the vessel whenever possible. (This allows you to lengthen the probe if necessary.)
  - b) Avoid mounting the LS8000 near the product inlet, vent return lines, dust collectors and vessel discharge openings on dry materials. Turbulence around these areas can cause erratic detection unless the probe is long enough. On old installations it might be wise to fill the vessel first to determine the length of the probe. We recommend a 36" top mounted high level probe in storage silos and 24" in smaller vessels such as bins.

**CAUTION:** Always take safety precautions before opening vessels for such inspections.

- c) On gravity filled vessels, take into consideration the angle of repose formed by the product.
- d) On dry product that flows like water (starch), when using the LS8000 to stop the flow by means of a butterfly valve or knifegate, make sure the probe is long enough to allow time to close these slow moving valves.
- e) In small vessels where a good location is hard to find, it may be necessary to put a baffle plate between the probe and the product inlet to keep product off of the probe as it fills. (A short time delay could also solve this problem.)

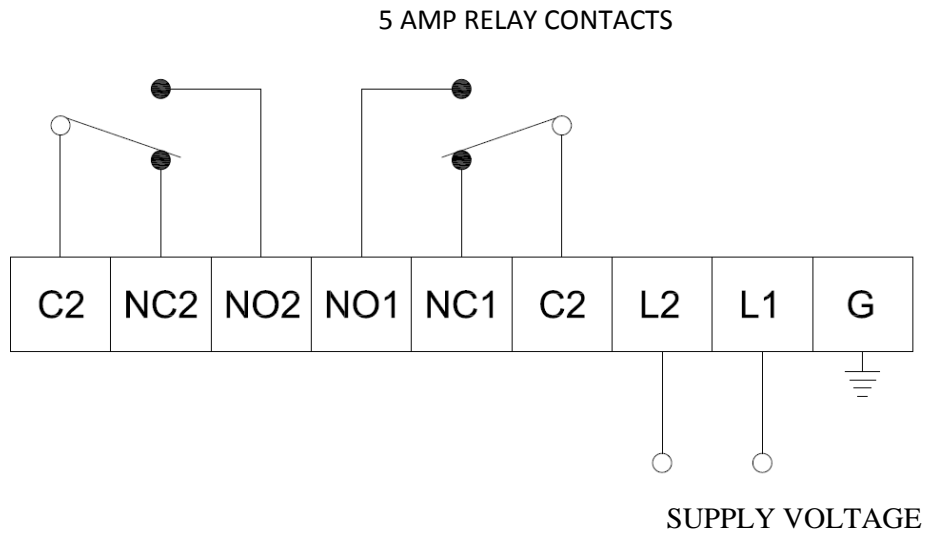
### 3.3 Installing the Receiver

The receiver is a printed circuit board measuring 3" x 4  $\frac{1}{2}$ ". It is mounted in a plastic snap track that is provided with each unit. The snap track can be mounted in existing control panels or enclosures can be ordered from the factory.

- 1) Attach the snap track to the panel back pan or other surface using 2 small screws or a suitable adhesive.
- 2) Snap the LS8000/R receiver card into the snap track.
- 3) Connect shielded cable to the 3 terminals marked G, S, +. (see page 9 for wiring diagram)
- 4) Connect the proper supply voltage and relay output wiring for your application. (see page 10-13)

**NOTE:** All wiring must conform to the National Electric Codes or other enforcing authorities that apply in your area.

3.4 Typical Applications & Wiring Diagrams:

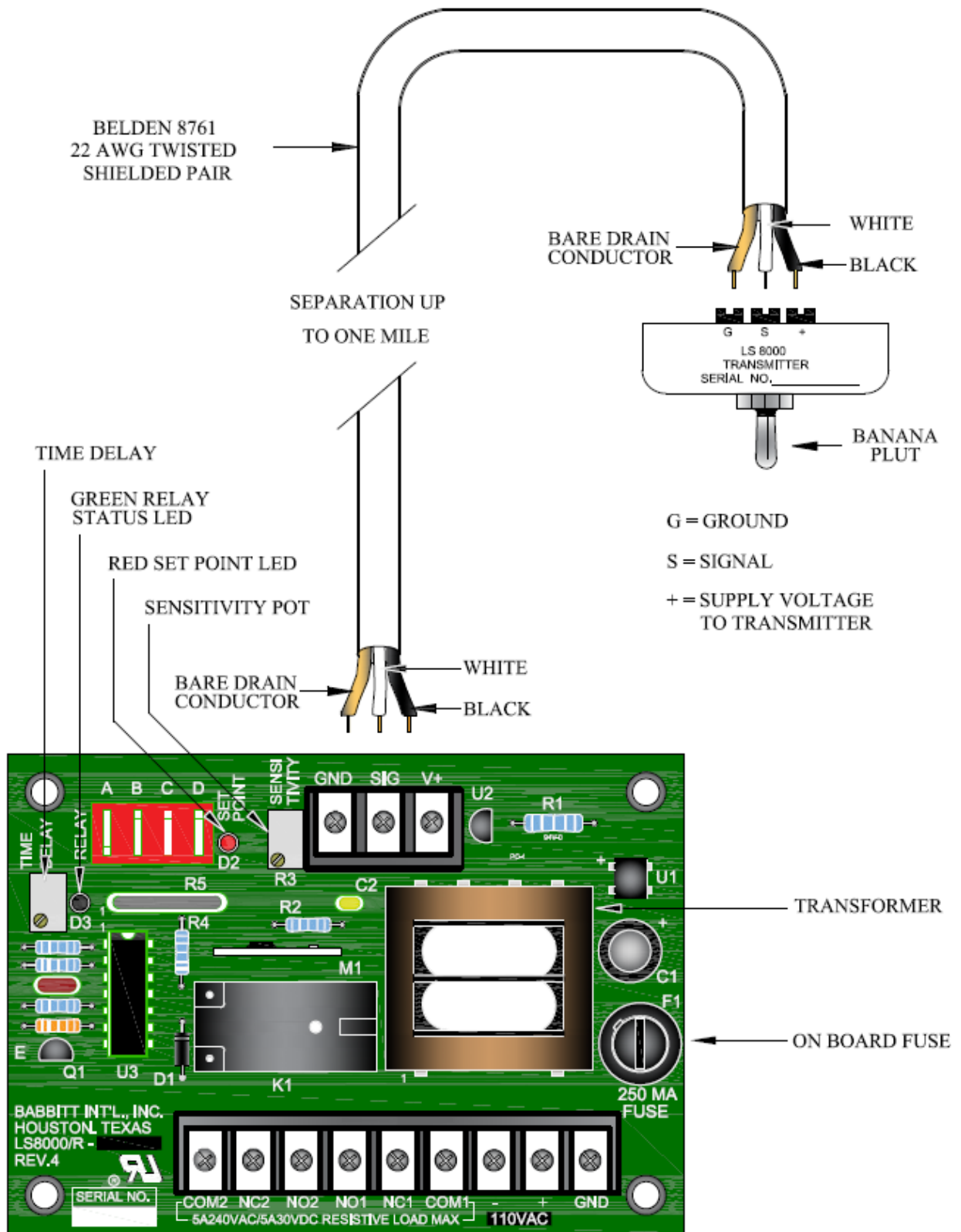


**NOTE:** EACH LS8000/R RECEIVER IS INTENDED FOR ONLY SUPPLY VOLTAGE – THIS VOLTAGE IS PRINTED ON THE POWER SUPPLY BOARD.

FOR 115VAC OR 230VAC UNITS HOOK UP THE HOT LEAD TO L1 AND THE NEUTRAL TO L2, WITH APPROPRIATE GROUND.

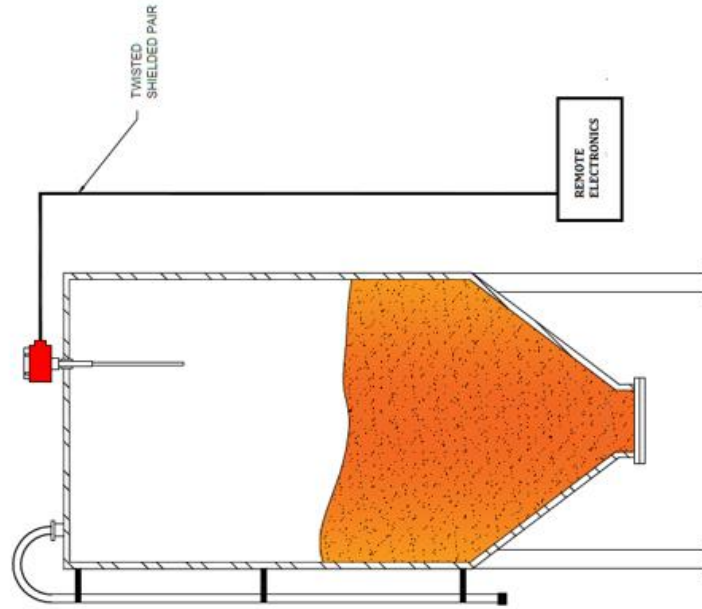
FOR 12 VDC OR 24 VDC UNITS, HOOK THE POSITIVE VOLTAGE TO L1 AND THE COMMON OR GROUND TO L2.



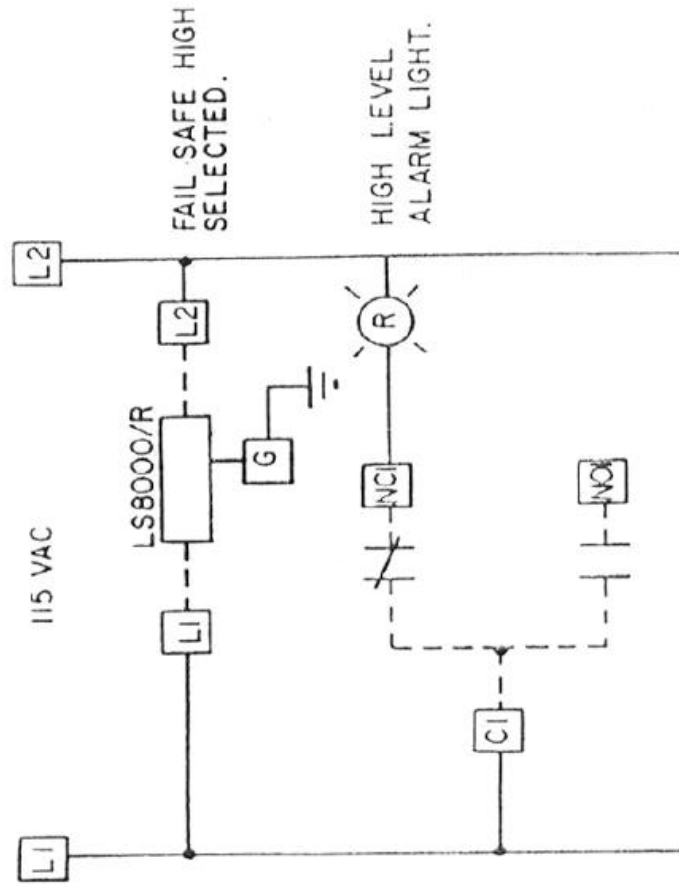


LS 8000 ELECTRONICS

APPLICATION - HIGH LEVEL ALARM

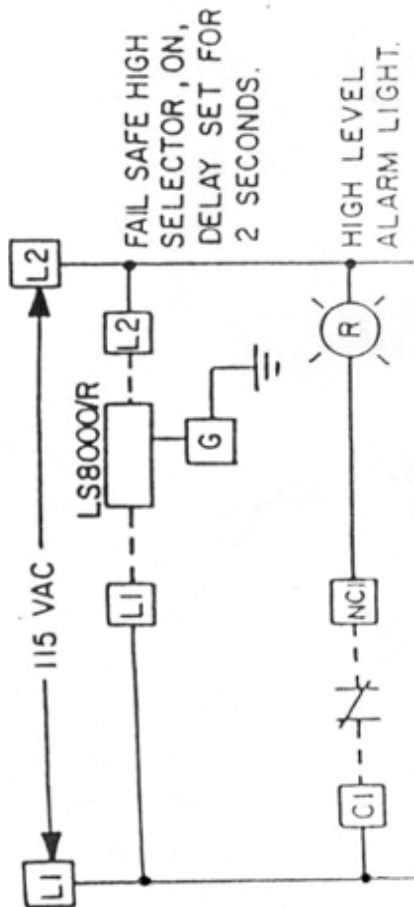


TYPICAL WIRING  
LS8000/RECEIVER \*



\*SEE PAGE 5 FOR WIRING  
RECEIVER TO TRANSMITTER.

TYPICAL WIRING  
LS8000/RECEIVER \*

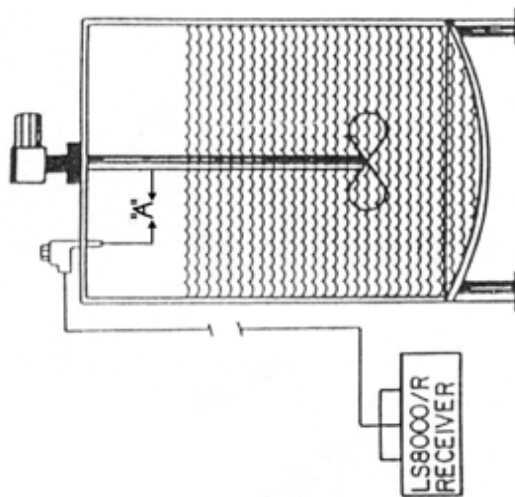


NOTE: PLEASE REVIEW FAIL SAFE  
SELECTION INSTRUCTIONS.

\*SEE PAGE 5 FOR WIRING  
RECEIVER TO TRANSMITTER.

APPLICATION

HIGH LEVEL ALARM USING THE TIME DELAY TO  
IGNORE SPLASHING OR WAVE ACTION.  
(TIME ON, INSTANT OFF)

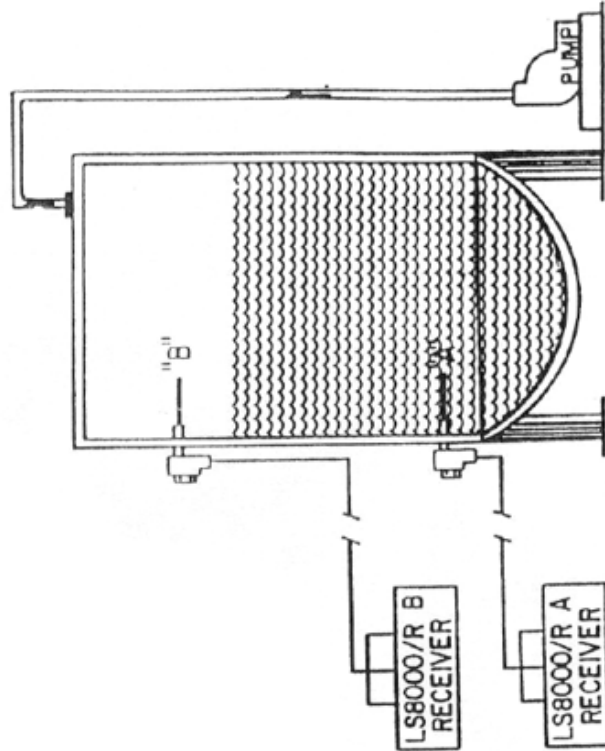
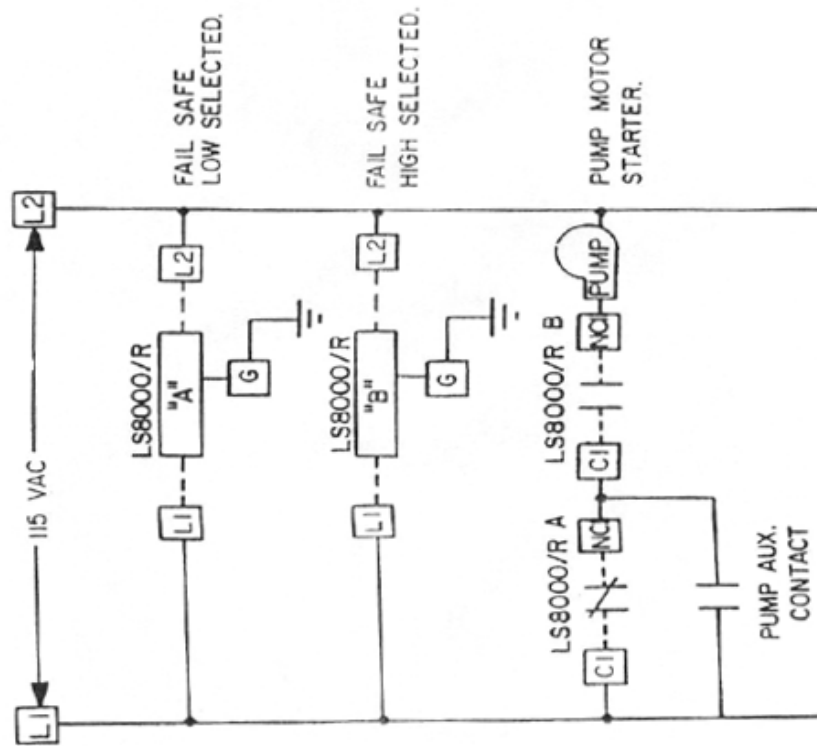


WHEN THE FLUID REACHES POINT "A"  
IT MUST REMAIN THERE FOR 2  
SECONDS BEFORE THE INDICATOR  
LED WILL COME ON.

APPLICATION - AUTOMATIC FILLING  
WHEN LEVEL FALLS TO POINT "A" PUMP  
COMES ON TO FILL. TO POINT "B" THEN TURNS OFF.

TYPICAL WIRING

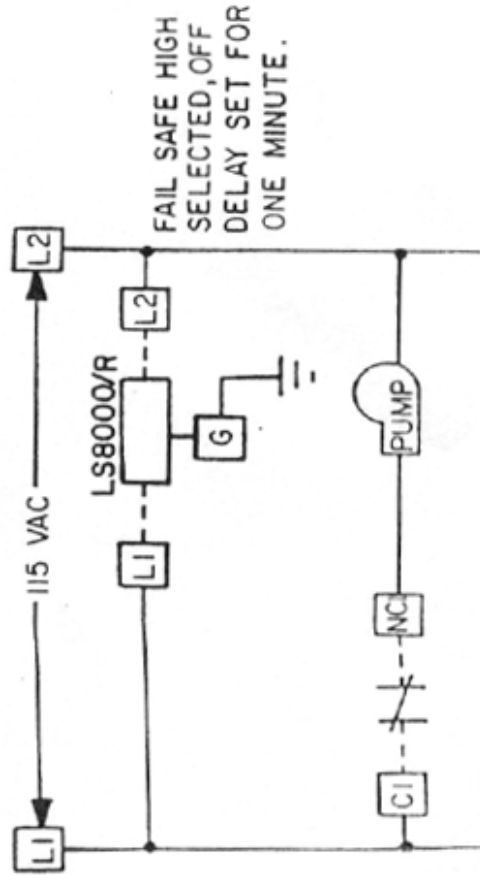
LS8000/R RECEIVER \*



\*SEE PAGE 5 FOR WIRING RECEIVERS TO TRANSMITTER

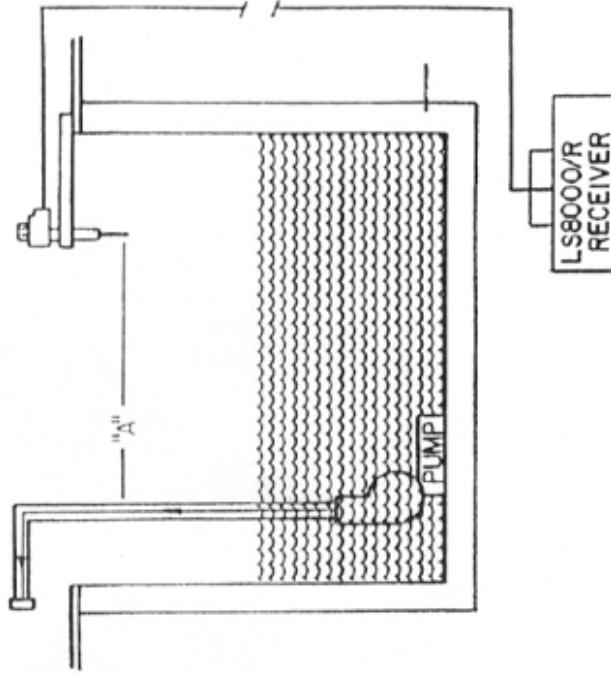
TYPICAL WIRING

LS8000/R RECEIVER \*



APPLICATION

PUMPING DOWN A SUMP USING  
OFF DELAY TIMER. (INSTANT ON, TIME OFF)



WHEN THE WATER LEVEL REACHES POINTS "A" THE  
PUMP WILL TURN ON AND CONTINUE TO RUN FOR 1  
MINUTE AFTER THE WATER FALLS BELOW THE PROBE.

NOTE: PLEASE REVIEW FAIL SAFE SELECTION  
INSTRUCTIONS

\*SEE PAGE 5 FOR WIRING RECEIVER TO TRANSMITTER

## 4. CALIBRATION

**PLEASE READ THE ENTIRE CALIBRATION PROCEDURE BEFORE CALIBRATING THE LS8000.**

### 4.1 Time Delay

The time delay is adjustable between 1/8 second to 2 hours. If no time delay is required, turn the time adjustment pot completely CCW and set S1 down, S2 up. The potentiometer has 20 turns and freewheels at the end of its travel without damage. You may hear “clicks” at the end of travel.

### 4.2 Setting the Time Delay

- 1) Setting the timing mode, either on delay or off delay is done by positioning S3 and S4 as shown in the chart below.

**NOTE:** S3 and S4 also select fail safe high level (FSH) or fail safe low level (FSL).

- 2) Select the timing range using S1 and S2 as shown on the chart below.
- 3) Adjust the time adjustment potentiometer clockwise to increase time or CCW to decrease until the exact time delay is reached.

**NOTE:** For long timing ranges you can set the timer for a shorter range, then change the range Switches (S1 and S2) to increase the time. For example, the desired time delay is 15 minutes. This is equal to 900 seconds. By setting S1 down and S2 up and adjusting the timer to approximately 28 seconds, the ratio on this range is 1. To increase this range by 32, move S1 up and S2 up. 32 x 28 seconds equals approximately 15 minutes.

### 4.3 Fail Safe Selection

The failsafe feature provides a “false alarm” in case of power outage or major component failures. When properly selected, the failsafe feature can protect equipment or alert you of a unit failure.

Fail Safe High (FSH) means that the relay is energized when NO PRODUCT is touching the probe. The green led indicates relay status and is on when the relay is energized. When product comes into contact with the probe, the relay is de-energized.

Fail Safe Low (FSL) means that the relay is energized when PRODUCT IS touching the probe.

**NOTE:** Due to the wide variety of applications and possible control or alarm functions, the proper fail safe selection will depend on your circumstances. Please call your distributor or the factory if you need assistance.

**TIMING RANGE**

S1	S2	TIME	RATIO
DN	UP	1/8 sec - 35 sec	1
UP	DN	1/2 sec - 140 sec	4
UP	UP	4 sec - 18 min	32
DN	DN	32 sec - 2 hrs	260

**FAILSAFE TIMER MODE**

S3	S4		
UP	UP	ON	FSL
DN	UP	DELAY	FSH
DN	DN	OFF	FSL
UP	DN	DELAY	FSH

#### 4.4 Sensitivity Calibration

The LS8000 should be calibrated when no material is touching the probe, when the unit is installed where it will be used.

1. Observe the Red LED. If it is on, go to Step 3
2. If the Red LED is off, turn the sensitivity adjustment potentiometer clockwise (CW) until it comes on.
3. Turn the sensitivity adjustment pot counter-clockwise (CCW) until the Red LED just goes out. This sets the unit to its maximum sensitivity. If in your application this is too sensitive, you can turn the sensitivity adjustment pot further CCW; usually ¼ to ½ turn is sufficient to reduce the units sensitivity. Always bring the product into contact with the probe after calibration to assure proper performance.

**NOTE:** The green LED indicates relay status. The relay is energized when the green LED is on.

#### SPECIAL CALIBRATION NOTES:

For some products, the LS8000 can be calibrated with product touching the probe. To do this, turn the sensitivity adjustment pot CW until the Red LED just comes on and continue CW for 1/8 to ¼ of a turn. Always check to see if unit resets in the absence of product

### 5. MAINTENANCE AND TROUBLESHOOTING

No routine maintenance is required other than keeping the interior of the unit clean and free of dirt, dust and other contaminants. The LS8000 consists of three main sub-assemblies. These are the enclosure with the flange sensor, the transmitter module and the receiver card. The following troubleshooting guide will assist in determining how to correct most of the problems which may occur in the field. Review the Installation and Calibration procedures in sections 3 and 4.

PROBLEM	POSSIBLE CAUSE	SOLUTION
RED LIGHT cannot be adjusted to turn on.	<p>Transmitter module not connected to probe.</p> <p>No power to unit.</p> <p>Blown on-board fuse.</p> <p>Bad receiver card.</p>	<p>Plug transmitter into probe.</p> <p>Check for correct power.</p> <p>Replace fuse.</p> <p>Repair or replace card.</p>

PROBLEM	POSSIBLE CAUSE	SOLUTION
<p>RED LED remains on at all times.</p>	<p>Probe is shorted to ground.</p>	<p>Unplug banana plug and position it so that the bare end is not touching anything. Turn calibration pot 20 turns CCW. LED should go out. If it does, repair, replace or clean probe. If LED does not go out, replace electronics. Check shielded cable for proper connection. Check shielded cable for shorts or open circuits.</p>
<p>Unit triggers when material touches probe, but will not reset when material recedes from probe / unit and gives false alarm.</p>	<p>Improper mounting of probe. Improper calibration procedure. Excessive material build-up on probe.  Probe is mounted in flow material.</p>	<p>Contact factory or distributor. See Section 4.1 or 4.2 Perform “dirty pipe calibration”; recalibrate with built up material on probe. See section 4.4  Revise mounting or use time delay</p>
<p>Unit will not detect material.</p>	<p>Improper calibration.  Transmitter module not plugged into probe. Unit was calibrated with material touching probe.</p>	<p>See calibration instructions, section 4  Plug transmitter module into probe.  Be sure material is not touching probe and recalibrate.</p>
<p>Unit will not stay in calibration.</p>	<p>Poor grounding of transmitter housing to vessel.</p>	<p>Provide secure ground connection.</p>
<p>Relay operates properly, but no signal at terminals.</p>	<p>Burned or broken lands on receiver printed circuit board.  Bad relay contacts.</p>	<p>Turn off power. Remove module from housing and inspect lands On printed circuit for damage. Replace if necessary. Replace relay or return for repair.</p>

**PLEASE CONTACT THE FACTORY OR YOUR DISTRIBUTOR IF YOU HAVE ANY QUESTIONS OR NEED ASSISTANCE. Customer Service: 1-800-835-8012 or 713-467-4438 (8:00 a.m. to 5:00 p.m. CST US)**



## 6. WARRANTY

All components of the LS8000 are warranted to be free from defects in material and workmanship for a period of two years from the date of purchase. This warranty applies to general purchaser and to components installed, serviced and operated according to instructions.

Babbitt International, Inc. will repair or replace, at its option, FOB at its plant or any other location designated, any part which proves to be defective in manufacture or workmanship.

All claims must be made in writing within the warranty period. No claims outside of the warranty period will be honored.

Warranties are not applied to any components which have been damaged by improper installation, use, exposure to unusual atmospheric conditions or components which have been misused, abused, damaged by neglect or accident. This warranty shall not apply to any components which have been altered or repaired without the prior written consent of Babbitt International, Inc.

Babbitt International, Inc. assumes no responsibility or liability for any labor or material back charges, without written authorization. Any products returned must be with prior written authorization.

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