



# **LEAK DETECTION LD2500**

## **USER MANUAL**





The LD2500 in a metal case



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## Product Description

The Leak Detection LD2500 system is comprised of two integral parts - the control head and the sensing cable.

### Control Head

#### Logic Board

The logic board contains all the electronics necessary to monitor the condition of the sense cable and to detect and compute the distance from the control head to the point where a conductive fluid has touched the cable. The control electronics drives the cables with a constant current. The signal is returned to the logic board through the end terminator attached to the end of the cable. The sense line is monitored by the control electronics and when a fluid comes in contact, it causes a conductive path across the two wires, and precisely measures the signal which is proportional to the distance from the control head. This signal is linear regardless of the conductivity of the fluid. A feature of the LD2500 is the addition of electronics to check for contamination which may get on the cable from various sources. This feature allows the operator to display the amount of current that is flowing between the two sense wires.

The system is always monitoring the continuity of the cable. In the event that no signal is returned, the control head goes into alarm which warns the operator that the sense cable has become disconnected or is defective in some way. In this mode, the cable LED will light, the cable relay will activate, and the audible alarm will sound.

When a leak is detected, a very precise electronic calculation is performed which can take up to 20 seconds to compute. The analog value is then converted to digital and displayed on the LCD screen. The 85dbA audible alarm will also sound.

A 4-20mA current loop is available, which when connected to an external device capable of receiving a current loop signal, can be used to provide additional historical information or outline the leak location on a PC or CRT screen. Additional applications are at the discretion of the user.

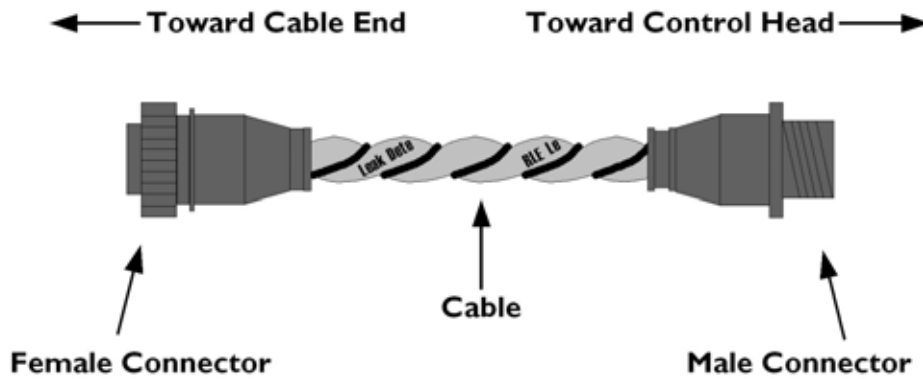


**NOTE: The system will alarm for the following conditions:**

**Leak Alarm**  
**Cable Alarm**  
**Loss of Communication Alarm**

#### Sense Cable

The exclusive sensing cable used with the LD2500 is a four conductor cable with #26 AWG wires for the two sensing conductors and #18 AWG wires for the two continuity conductors. Each sensing conductor responds to the presence of a conductive fluid. The two sensing conductors are separated by a polymer coated carrier designed to maintain proper separation plus permit a small bend radii. The resulting flexible cable is easy to install and allows for fast drying in the event of an actual leak. Adding additional cable in the field is easy. Twist lock connectors make



**Figure I-1  
Sense Cable**

connecting and disconnecting the cables easy for installation and replacement.

The sense cable is pre-measured in 25', 50', and 100' lengths to make the installation easy. Custom lengths can also be provided.

The graphic floor plan can be updated if additional cable is installed on the system. In order to ensure accuracy, the system should be remapped before a new graphic floor plan is created.

### **Options**

#### **Remote Display**

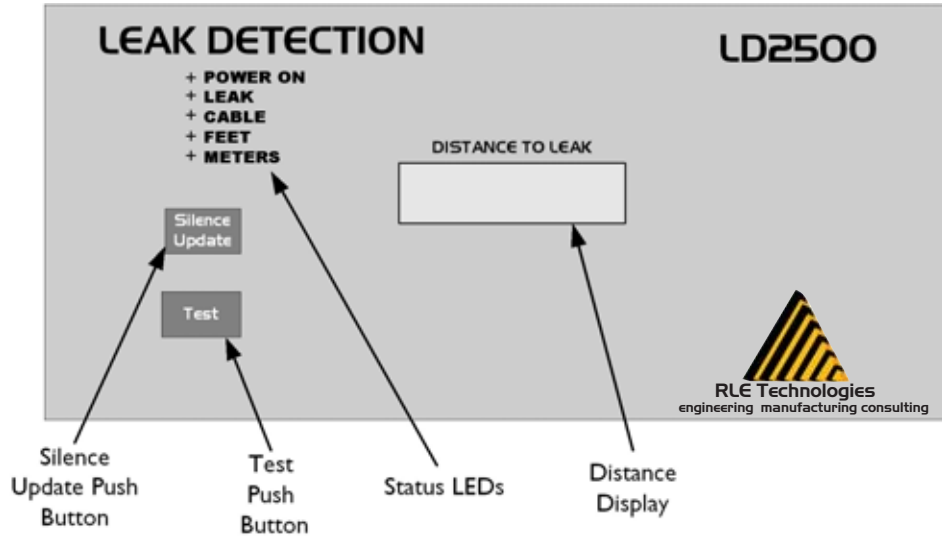
The Leak Detection System LD2500 can be equipped with an optional remote display

panel. Up to eight remote display panels can be connected to the main display. See Table 1 on page 13 for remote display addressing. Functions available are: alarm silence, test, update or reset. Indicators are: power on, leak alarm, cable alarm, four digit LCD display for distance measurement and leakage current, feet and meter indicator. The LD2500 display with address "0" is the master and the optional remote displays, LD2500-RD are 2 through 8.

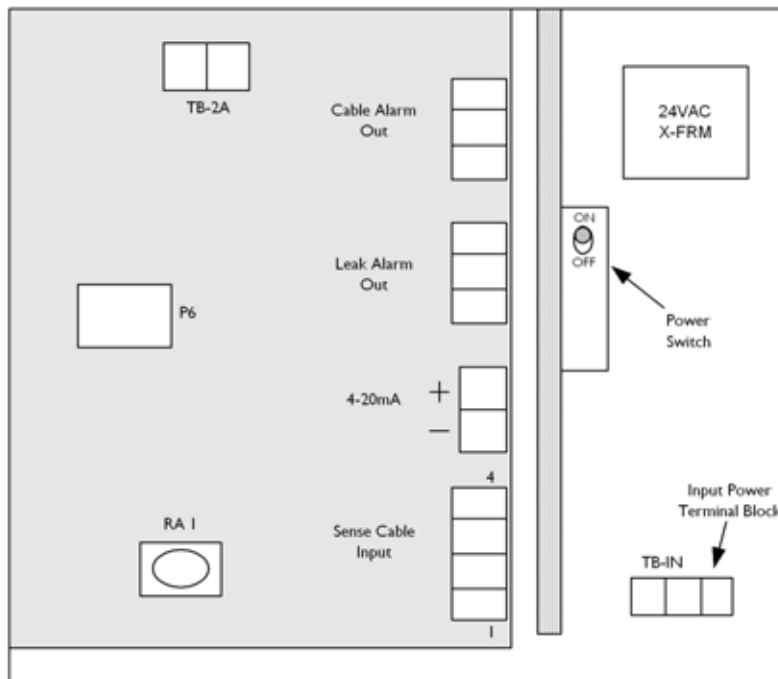
The remote units cannot update (reset the system) - this can only be accomplished at the master display. Resetting only by the master display ensures that the alarm condition is noted and not prematurely cleared.



# System Controls




**Figure I-2**  
**System Controls**



**Figure I-3**  
**Control Head Component**

## Description of Controls

 **NOTE:** Access to these controls is made when the front cover is opened. (fig. 1-3)

### Power ON/OFF Switch

This switch is used to turn the system on and off while making switch changes or connecting or disconnecting wires from the system.

### Input Power Terminal Block

The input power is connected to this terminal block.

### Sensitivity Control RAI

This control is used to change the size of the leak required to alarm the system.

### Sense Cable Input

This terminal block is used to connect the wires from the sense cable.

### 4-20mA

Terminal block connection for external signaling. Switch 1 setting allows selection to internal or external powering of the loop.

### 4-20mA Output

4mA represents no alarm.

6mA represents a leak at 0'.\*

16mA represents a leak at the end of the cable.\*

20mA represents cable problem.

\* The scale between 6mA and 16mA is determined by the dip switch settings described in Table 2, page 13.

### Cable/Leak Alarm Out

Dry contact terminal blocks for remote signaling.

### Four Digit LCD Display

This display is used to give a visual indication in feet or meters of how far from the control head the system has detected a leak.

### Silence/Update Push Button

This push button is used to functionally operate the system. When it is pressed under alarm conditions, it silences the audible alarm. The distance to the leak is displayed. To update the system, the switch is held for more than two seconds. This action normally is taken after the leak has been corrected and the cable dried. If it is done before the leak is corrected and the second reading is substantially different from the first reading, this means that there is another leak present on the cable. The location of the second leak can be determined by lifting the cable out of the fluid at the first location and updating the system. It will now display the location of the second leak. This procedure can be used to determine the location of multiple leaks.

**Test Push Button**

This switch is used to test the system and is used when no alarm conditions exist. The first depression will indicate the amount of leakage current found on the cable. The smaller the value, the better the system operation. A value of "0" is excellent, values between 1 and 50 are considered "OK". Values above 51 indicate moisture or contamination on the cable. The Leak Alarm LED will flash during this test. Depression of the test switch for the second time, the display will indicate the length of cable attached to the system and the cable LED will flash. The value will be displayed for a few seconds and then the display will become blank.

**Power On LED**

This LED is on as long as power is applied to the system.

**Leak Alarm LED**

This LED lights when the control head senses a conductive fluid touching the cable. The distance to the leak is displayed in the LCD within 20 seconds. The audible alarm will sound and the leak alarm relay will transfer.

**Cable LED**

This LED lights when the control head no longer senses the continuity of the cable.

**Feet LED**

This LED is on when the switch is set for a reading in feet (see table I-1).

**Meter LED**

This LED is on when the switch is set for meters (see table I-1).

 **NOTE:** Make sure that the “System Status” LED is illuminated.

### Resetting the Audible Alarm:

1. To silence the Audible Alarm, push the Silence/Update push button. This should silence the alarm. If it does not, see the trouble shooting guide in the back of this manual.

### Resetting the System:

1. The LD2500 detects liquid leaks and shows the distance, in feet or meters, from the control head. The system is reset, after the leak has been corrected and the cable has been dried, by pressing the Silence/Update switch for two seconds.

2. If a leak alarm LED is displayed after the update switch has been pressed, the system is still detecting a fluid on the cable and this condition will have to be corrected before the system is restored to normal.

3. The system should not be restored until you are sure that the condition that caused the alarm has been cleared. If you restore the system and a liquid is touching the cable in two or more places, the reading shown in the display is an average of the combined readings. It is advised to record the value first shown on the display.

### Resetting Cable Trouble:

1. The Cable LED indicates that the sense cable has become disconnected or the cable may have been damaged and will require repair. If the Update push-button function will clear the cable trouble, but it comes back on, the cable will need attention. See the Trouble Shooting Guide for a simple method of determining the location of the problem.

### Testing the System:

1. Press the Test Switch twice and observe the following:

a. The system displays the total length of cable installed on the system.

b. The system ignores any jumper cables installed in the system. If the total length shown is not within 1% of the amount of cable connected to the control head, the reason for the discrepancy must be investigated.

2. The system operation should be checked by wrapping the end of the cable with a wet (not just damp) towel to verify the detection of the alarm.

## Installation

### Locating the LD2500

The location for the LD2500 should be chosen so that it is convenient to operate and observe.

### Control Head Installation

1. The control head is mounted on the surface or recessed for flush mounting.

2. A 120VAC power source is required to the terminal block provided inside of the control head. The terminal block designations are as follows:

Input power:

TBIN-1 120VAC In

TBIN-2 Ground

TBIN-3 Neutral

3. Terminal blocks are provided to interface the appropriate wiring to the sense cable.

Sense cable:

TB7-1 White Lead Sense Cable

TB7-2 Black Lead Sense Cable

TB7-3 Green Lead Sense Cable

TB7-4 Red Lead Sense Cable

See the Sense Cable installation on page 11 for additional information.

4. Leak alarm relay:

TB4-1 Leak Alarm Common

TB4-2 Leak Alarm N/C

TB4-3 Leak Alarm N/O

5. Cable alarm relay:

TB5-1 Leak Alarm Common

TB5-2 Leak Alarm N/C

TB5-3 Leak Alarm N/O

6. 4-20mA loop:

TB6-1 4-20mA (+)

TB6-2 4-20mA (-)

7. Display communications:

TB2A-1 Display (+)

TB2A-2 Display (-)

8. Display power:

P6-1 Display 24VAC

P6-2 Display Common

### Floor Map

If a floor map was included with the system, it is highly recommended that it be compared to the "as installed" cable on the floor. Note any discrepancies and return the map to the original author for correction. Keep a copy for use until the updated map can be reinstalled near the control head.

### Summary Alarm Connection

The interface terminal block TB4 and TB5 are found in the upper right portion of the main logic board. Connect the interface cable to the alarm terminal blocks. The Leak and Cable Alarms can be paralleled to provide a summary alarm capability.

### 4-20mA Operation

Before connecting any external device to the LD2500 the following procedure should be followed to ensure that the 4-20mA is operating properly.

1. Remove the two position plug on TB6.

2. Install a 200 Ohm resistor across TB6-1 and TB6-2.

3. Reinstall the plug on TB6.

4. With the system on and no alarms, measure with a multimeter for 0.8 VDC across the resistor. (This equates to 4mA or normal operation).

5. Remove the Cable Plug TB7 and wait for the unit to alarm with cable trouble. When it does verify that the reading across the resistor is approximately 4.0 VDC (this equates to 20mA or cable trouble), replace the plug.

6. Place water on the end of the cable. Measure the C voltage across the resistor. The value will be proportional to the length of cable set on the dip switches. (This equates to a leak at the end of the cable). Dry the cable and reset the system.

7. Place water on the start of the cable. Measure the DC voltage across the resistor for approximately 1.3 VDC. (This equates to a leak at zero feet.) Dry the cable and reset the system.

### DIP Switch Settings

Using the table on page 13, set the DIP switches to match your application.

### Explanations

1. **Latch Alarm:** This feature requires a manual reset of the system once a leak or cable problem is no longer present. To enable this feature, the Latch Alarm should be set to “**ON**”.

2. **Non-Supervised/Supervised:** This feature makes it possible to use the alarm relays as supervised contacts. If the relay is set to supervised, the relay will be closed

as long as no alarm condition exists. A leak, cable trouble or a power failure will cause the relay to open.

3. **Update Reset Relays:** This feature allows the alarm relays to reset when the update switch is pressed for more than two seconds. When the switch is set to **YES**, the switch will reset the relays. When the switch is set to **NO**, the leak or cable problem will have to be corrected before the relay will reset.

### Sense Cable

1. Installation of the system is much simpler if the control head is installed first and powered before the cable is laid. This will allow any cable problems to come to the installers attention immediately.

2. Connect the 15' lead cable to the control head. Install the end terminator on the end of the leader cable and test the system. If OK, proceed.

3. Remove the end terminator and attach the first length to be installed. Route the cable according to the cable layout drawing. Do not install the cable directly in front of an air conditioner. Allow a minimum of 6' in front of the unit. If the cable is too close to the air stream of the A/C unit, the moisture from the humidifier may cause false readings. Place the end terminator at the end of the cable and retest the system. If there are no errors, install the next section of sense cable following the same procedure described above.

4. Mark the drawing with distance readings and any variances between the drawing

and the as installed cable run. Clamp the cable to the floor by using the J-Clips if provided otherwise use one of the approved methods found on page 12. The clips should be between 12" and 18" apart when installing cable in front of an A/C unit. When not in a direct air stream, one clip every 4' is sufficient. One clip should be at each turn of the cable. If the cable is installed over an obstruction, the cable should be clipped on both sides as close to the obstruction as possible. The system should alarm approximately 20 seconds after the end terminator is removed from the cable. If it does not, check the wiring and cable installation. Repeat the mapping process for the remaining cables. Leave the end terminator on the last cable installed.

5. Press the Test push-button twice to read the total length of cable installed. If this reading varies by more than  $\pm 5\%$  of the actual cable installed, verify the installation.

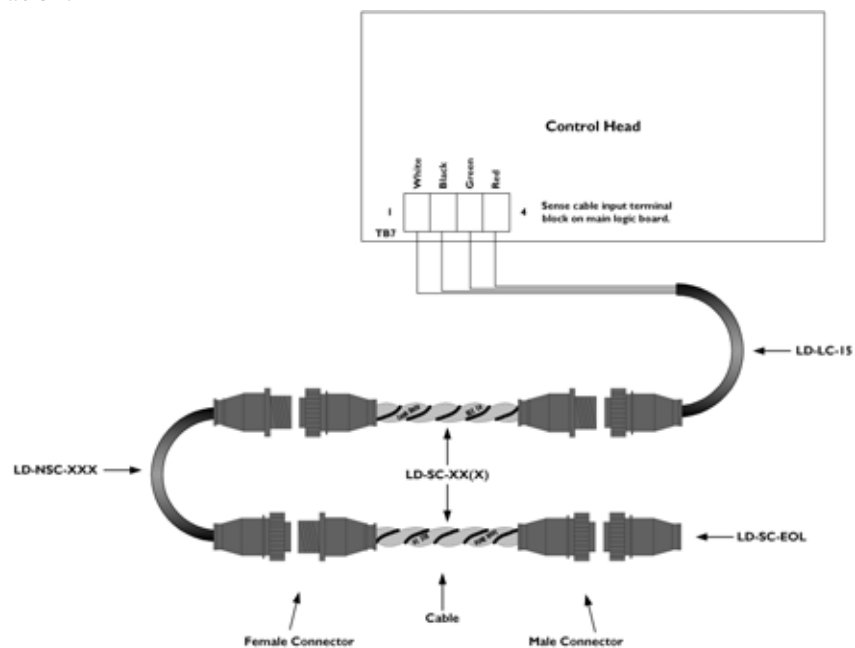
6. To reduce the time between readings, place the system in the mapping mode of operation by setting DIP Switch SW2, position 8, "ON". This is the mapping mode switch. Power the unit **OFF** and then **ON** to reset the system.

7. Set the cable length scale for the analog 4-20mA loop. Use the table on page 13, Table 2, SW3.


8. Using the revised "as laid" cable routing map, map the system (see mapping instructions on page 10).

9. Return the system to normal by pushing the mapping switch to **OFF** and powering the system **OFF** and then **ON**.

10. This completes the installation of the system.



**Figure I-4**  
**Sense Cable Interconnect**




**NOTE: The system must be calibrated prior to mapping.**  
(See calibration on page 12)

### Mapping the System:

1. After the sense cable has been laid in the desired configuration, the system can be mapped so that when a leak is detected, the exact location of the leak can be determined (the distance shown on the control head).
2. Since the control head only computes the distance in terms of length of cable, it is necessary to short the cable at various points by placing the cable in water and marking the reading on the floor map. This system of mapping will make finding the leak easier.
3. The following procedure should be followed when mapping the cable layout:
  - a. If a floor plan has been provided by RLE Technologies, skip to step c.
  - b. Create a drawing that represents the layout of the room along with the routing of the sense cable. Include in this drawing any jumpers.
  - c. Turn DIP SW 2-8 to the **ON** position (mapping mode). Power the unit **OFF** and then **ON**.
  - d. Using a water soaked paper towel, wrap the cable with the towel and record the reading in the display. Mark the floor map

with this reading. Repeat this procedure at each turn of the cable or at a minimum of 50'. Additional points can be mapped if it would make the mapped system easier to use. Dry the cable with a towel after each mapped location is completed. Make sure that the leakage current is less than 10 when you have completed drying the cable.

- e. For each mapped point, update the floor plan with the reading shown on the control head's display. Dry the cable.
- f. Repeat the process until the end of the cable has been reached.
- g. Place the control head in the normal mode by positioning the mapping switch in the **OFF** position. Turn **OFF** the power and then back **ON** to restore the system to normal operation.
- h. As additional cable is added to the system in the future, the same procedure can be used. The system can accommodate 2000' of sense cable. Jumper cables are not included in the 2000' of sense cable. If more than 2000' is required, an additional control head is needed for each 2000' of sense cable.



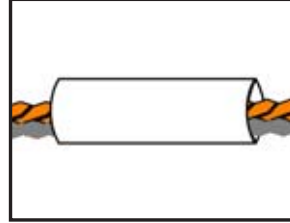
**NOTE: If additional cable is added to the system or if cable is replaced, the system should be remapped.**



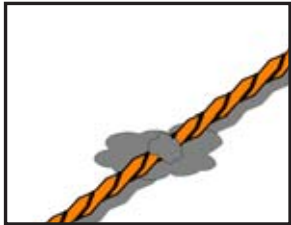
### Recommended Installation Methods



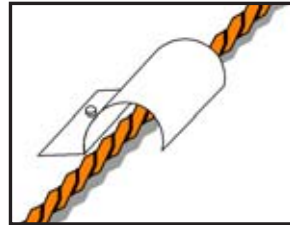
Laid freely on the floor. Only recommended in spaces with no access.



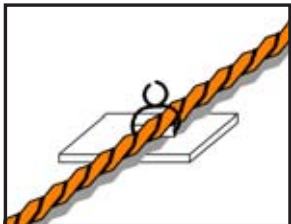
Installed in protective cover.



Secured to floor with mastic.

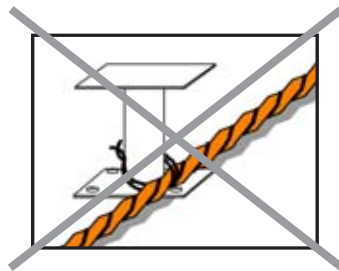


Secured to floor with J-clip.



Secured to floor with tie wrap.

### Not Recommended



Tied to floor Pedestal

**Figure I-5**  
**Cable installation methods**

The LD2500, under normal usage, requires no special maintenance. The overlay should be cleaned with a soft cloth. Do not use solvents which are acetone based. It is suggested that the Test circuit be activated once per month to verify that the system is functional, the audible alarm and leak and cable relays are functioning, and the analog circuit is functional. It is also recommended that water be placed on the cable to verify that the calculation for the distance has not lost calibration. These tests will verify that the LD2500 is fully operational.

### Sensitivity Adjustment

Conditions under which leaks can be detected vary from application to application. If the leak detection system alarms more frequently than you would like, the sensitivity for the system can be adjusted by turning potentiometer RA1. Counter-Clockwise (CCW) decreases the sensitivity, i.e. it takes more liquid on the cable before the alarm is triggered. Clockwise (CW) increases the sensitivity and less liquid is required on the cable to trip a leak alarm. The setting that you select will depend upon your particular application (see figure I-6).

### Calibration

#### Test - RA2

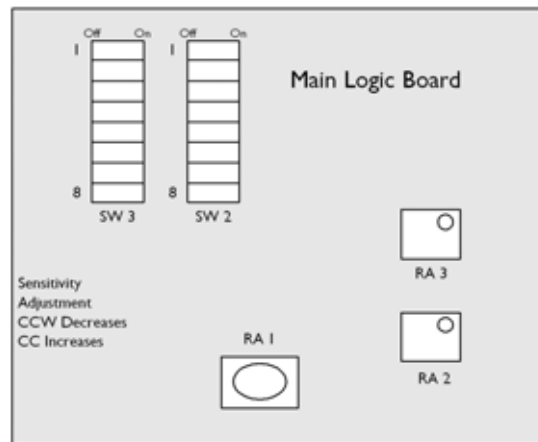
Turn RA2 CCW to increase reading, CW to decrease reading. Press the Test Switch and set reading equal to number of feet on the system.

#### Leak - RA3

Put water on the end of the cable and turn RA3 CW to increase or CCW to decrease the reading until it is equal to the length of installed cable. The system will require updating after each adjustment until the correct reading is displayed.

#### Control Head Testing

The system should also be tested at the far end of the cable with water to insure that proper length is shown on the display.



**Figure I-6**  
**Mapping Mode**  
**Switch/Calibration Controls**

## Dip Switch Setting Tables

**Table I-1 Main Logic Board Switches**

Switch	Position	Function	Off	On
S-2	1 thru 4	Display Panel Address	See Table 1	See Table 1
	5	RS-485 Baud Rate	9600	1200
	6	Display Units	Feet	Meters
	7	Latch Alarm	No	Yes
	8	Mapping Mode	Off	On
S-3	1 thru 3	4-20mA Scale	See Table 2	See Table 2
	4	Leak Alarm Relay	Non-supervised	Supervised
	5	Cable Alarm Relay	Non-supervised	Supervised
	6	Update SW Resets Relays		No Yes
	7 & 8	Factory Use		

**Table I-2 Display Board - Logic Board Address SW2**

Address	SW2-1	SW2-2	SW2-3	SW2-4
1	Off	Off	Off	Off
2	On	Off	Off	Off
3	Off	On	Off	Off
4	On	On	Off	Off
5	Off	Off	On	Off
6	On	Off	On	Off
7	Off	On	On	Off
8	On	On	On	Off

**Table I-3 Analog Scale for 4-20mA Loop**


Leak @ end of cable = 16mA	SW3-1	SW3-2	SW3-3	4-20mA Output
250'	Off	Off	Off	4mA = No alarm 6mA = Leak at 0' 16mA = Leak at the end of the cable 20mA = Cable problem
500'	On	Off	Off	
50'	Off	On	Off	
1000'	On	On	Off	
12500'	Off	Off	On	
1500'	On	Off	On	
1750'	Off	On	On	
2000'	On	On	On	
Setting 1000" leak at 564 = $((564/1000) \times 10) + 6 = 11.64\text{mA}$				
Setting 1750" leak at 1472 = $((1472/1750) \times 10) + 6 = 14.41\text{mA}$				

## Trouble Shooting

<b>Problem</b>	<b>Primary Action</b>	<b>Secondary Action</b>
1. Display blank, status LED is off.	Verify that power is being supplied.	Have a qualified technician check the connections.
2. Display blank, power ON LED is lit.	Normal operation for this unit.	None
3. No audible alarm.	Verify power to unit.	Unit defective, contact service.
4. No external analog signal (4-20mA).	Check the analog output terminal block connections.	Unit defective, contact service.
5. Cannot silence the audible alarm.	Unit defective, contact service.	None.
6. Cannot reset the LD2500.	Unit defective, contact service.	None.
7. Incorrect readings on display.	This indicates a leak in more than one location.	Lift and dry the cable at the first display, and go to the place indicated by the display.
8. Test will not function.	Unit defective, contact service.	None.
9. Flashing display.	Unit defective, contact service.	None.
10. Cannot get rid of cable trouble.	Check for secure connections or damage to the sense cable.	Unit defective, contact service
11. Wrong length on display during test.	Water has been detected at the same time as unit performs the test update.	Unit defective, contact service.
12. Leak alarm relay is not transferring	Check wiring to the leak alarm terminal block.	Unit defective, contact service.
13. Will not detect water.	Check sensitivity setting of RAI.	Unit defective, contact service.
14. Alarms randomly when updated.	Check for high humidity condition.	Unit defective, contact service.
15. False alarms display active 3 seconds after alarm sounds.	Mapping switch is ON, set the switch to OFF, Turn power OFF then ON to reset.	Unit defective, contact service.
16. Loss of communication.	Display has lost communications with the main logic board. Check wiring.	Unit defective, contact service.

## Technical Specifications

Input Rating	120 VAC @ 100ma
Output Rating	4-20ma Current Loop
Detection Accuracy	1% of Total Length
Display	4 Digital LCD, 0.6"H
Visual Indicators	System Normal LED Leak LED Cable LED Feet LED Meters LED
Alarm Response	20 Seconds
Controls	Silence/Update Push Button Test Push Button
Audible Alarm	90 dbA @ 1 meter
Leak Alarm Relay	5amp @ 30VDC, Form "C" Supervised or Non-Supervised, Field Selectable
Cable Alarm Relay	5amp @ 30VDC, Form "C" Supervised or Non-Supervised, Field Selectable
Dimensions	12.0"W x 18.0"H x 4.0"D 305mmW x 457mmH x 101mmD
Weight	5 lbs (2.33kg)
Operating Environment	32°F-140°F (0°C-60°C) 0-100% RH Non-condensing - 250-15,000 ft.

 **NOTE:** In order to protect the LD2500, a 15Amp circuit breaker will be required in the branch circuit supplying 120VAC power to the unit.







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