



LD5100 USER GUIDE

RLE TECHNOLOGIES





LDS100



## **TABLE OF CONTENTS**

Chapter 1: Product Overview .....	1
1-1 Description .....	1
1-2 Operation .....	1
1-3 Mechanical Description .....	1
1-4 Installation .....	1
1-5 Floor Map .....	1
1-6 LCD User Interface .....	2
Chapter 2: Connections and Settings .....	4
2-1 Main Board .....	4
2-2 Power Board .....	6
Chapter 3: Installation .....	7
3-1 Installing the Unit .....	7
3-2 Connecting the Water Leak Detection Cable .....	7
3-3 Apply Power to the Unit .....	9
Chapter 4: 4-20MA Output Testing .....	10
Chapter 5: LCD Interface .....	11
5-1 Default / Idle Display .....	11
5-2 Main Menu .....	12
5-3 View Zones .....	12
5-4 Cable Status Option .....	13
5-5 Alarm History / Trend Log .....	14
5-6 Comm Port StatusMenu .....	15
5-7 View Map .....	15
5-8 System Setup ( <i>Password Protected</i> ) .....	15
5-9 Zone Setup .....	17
5-10 Point mapping .....	18
5-11 Comm Port Settings .....	18
Chapter 6: Mapping the Cable .....	19
6-1 Mapping Directions .....	19
Chapter 7: RS232 Interface .....	21
7-1 Boot up .....	21
7-2 Main Menu .....	22
7-3 SC - System Configuration .....	22
7-4 LS - Leak Status .....	23
7-5 AR - Alarm Reset .....	23
7-6 AH - Alarm History .....	23
7-7 CH - Clear Alarm History .....	23
7-8 TD - Trend Data Table .....	24
7-9 CT - Clear Trend Data Table .....	24
7-10 TI - Display Date/Time .....	24
7-11 MT ON - Measurement Trace On .....	24
7-12 MT OFF - Measurement Trace Off .....	24
7-13 EX - Exit .....	24
Chapter 8: Modbus Communication .....	25
8-1 Implementation Basics .....	25
8-2 Packet Communications for the LD5100 .....	26
8-3 RTU FRAMING .....	28
Appendix A: Updating Firmware .....	29
A-1 Updating the Flash Firmware .....	29
Appendix B: Preventive Maintenance .....	30
Appendix C: Troubleshooting .....	31
Appendix D: Technical Specifications .....	33

## ***LIST OF FIGURES AND TABLES***

Figure 1-1 LD5100 LCD Interface	Figure 1-2 R2 Contrast Adjustment	3
Figure 1-3 LD5100 Enclosure Interior		3
Figure 2-1 LD5100 Main and Power Boards		4
Figure 3-2 Cable Installation Methods		8
Figure 4-1 4-20mA Testing		10
Table 1: Exception Codes		25
Table 2: Read Output Registers Packet Structure		26
Table 3: Output Registers		26
Table 4: Read Input Registers Packet Structure		27
Table 5: Input Registers		27
Table 6: Status Flags (Register 30001):		27
Table 7: Preset Single Register Packet Structure		27
Table 8: Preset Multiple Registers Packet Structure		28
Table 11: Query Sample		28
Table 12: Response Sample		28

## ***CHAPTER 1: PRODUCT OVERVIEW***

### **1-1 DESCRIPTION**

The LD5100 is a complete monitoring system that detects and reports the presence of water and other conductive liquids. The LD5100 couples RLE leak detection cable with an advanced control panel. Each LD5100 monitors up to 5,000 feet of leak detection cable. When a conductive liquid comes in contact with the water leak detection cable an alarm sounds and the distance to the leak is shown on the LD5100's LCD front panel display.

The LD5100 allows a single person to perform the mapping of the cable - the process of determining the relationship between a known point along the cable and the value as measured by the LD5100.

### **1-2 OPERATION**

When the LD5100's analog circuitry measures a current in excess of the user-defined leak threshold, the unit's microprocessor computes the distance to the leak. The unit then annunciates the leak and logs the alarm in its event log. The leak relay and fault relay each have two outputs. An additional 4-20mA output allows the device to interface with third party management systems.



#### **NOTE:**

The LD5100 produces an alarm in the following conditions:

- **Leak Detected**
- **Cable Break**
- **Cable Contamination**
- **Loss of Communications**

The LD5100 is a supervised system - it continually monitors the cable for continuity. A cable break or excess contamination of the cable causes a cable break indication and activates a relay.

### **1-3 MECHANICAL DESCRIPTION**

The LD5100 is built with three circuit boards:

- The **display board** is connected to the main board with a twenty wire ribbon cable and two power wires. The display board is mounted on the inside of the unit's door.
- The **main board** is mounted inside and on the back of the enclosure. A reset switch is provided to reset the microprocessor without cycling power to the unit.
- The **power board** is supplies 24 VDC power from a selectable 115 or 230 VAC input. This power board is mounted to the right of the main board.

### **1-4 INSTALLATION**

The LD5100 with LCD is a wall mounted device. Before applying power to the unit, ensure that all connections are correct and all screw terminals are secure.

### **1-5 FLOOR MAP**

Users may purchase a water leak detection cable reference map with their LD5100. Once all the water leak detection cable is installed, compare this reference map with the actual cable installation. 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 panel.

## 1-6 LCD USER INTERFACE

The LD5100's LCD is a 160x160 pixel resolution backlit display with a five button keypad. The interface's menu structure is as follows:

- Main Menu
  - View Zones
  - Cable Status
  - Alarm History/Trend
    - Alarm History
    - Trend
    - Erase Alarm History
    - Erase Trend Log
  - Comm Port Status
  - View Map
  - System Setup – *Password Protected*
    - Leak TripPoint
    - Contam TripPoint
    - Leak Delay
    - Contam Delay
    - Re-Alarm Delay
    - Latching Alarms
    - 4-20MA Max Range
    - Feet/Meters
    - Language
    - Cable Test Relay
    - Restore Defaults
    - Clock
    - Res/Ft
  - Zone Setup
  - Point Mapping
  - Comm Port Settings
    - Port1 Type
    - Port1 Addr
    - Port1 Baud
    - Port2 Type
    - Port2 Addr
    - Port2 Baud
  - Reset

Navigate through the menu(s) with the **up**, **down**, **left** and **right** arrows. **Left** will navigate left on menus or cancels any action and returns to the previous menu (where labeled on LCD submenus). **Enter** (↵) selects a submenu and commits changes. Further LCD interface information can be found on pages 11-

**Error! Bookmark not defined.**



Figure 1-1 LD5100 LCD Interface

Figure 1-2 R39 Contrast Adjustment

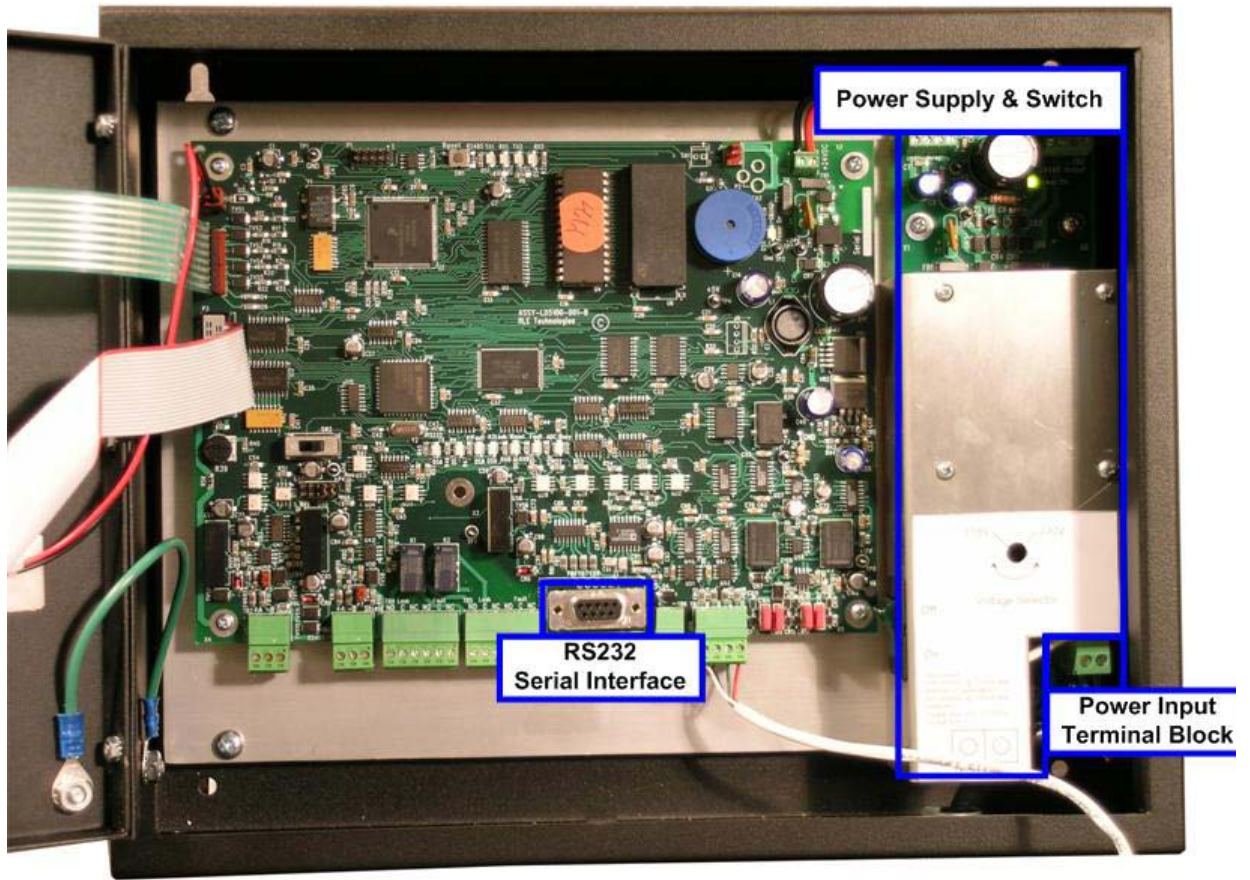


Figure 1-3 LD5100 Enclosure Interior



**WARNING!**

A dedicated circuit breaker must be provided in the building within close proximity to the LD5100 and be clearly marked as the disconnecting device for this unit.

## CHAPTER 2: CONNECTIONS AND SETTINGS

The LD5100 is comprised of three boards. All three boards are accessed when the device’s front cover is opened. The display board is located on the inside of the door. The main board is the large board on the left side of the enclosure. The power board is mounted on the right side of the enclosure and is connected to the main board via the two power wires located on the top right of the main board to the top left of the power board.

The connectors on the main board, found at the bottom of the following photograph, are labeled TB2 through TB7. The connector on the power board is labeled TB3. The (reset) switch on the main board is labeled SW1.

**TB1 – 24V  
Input Power**

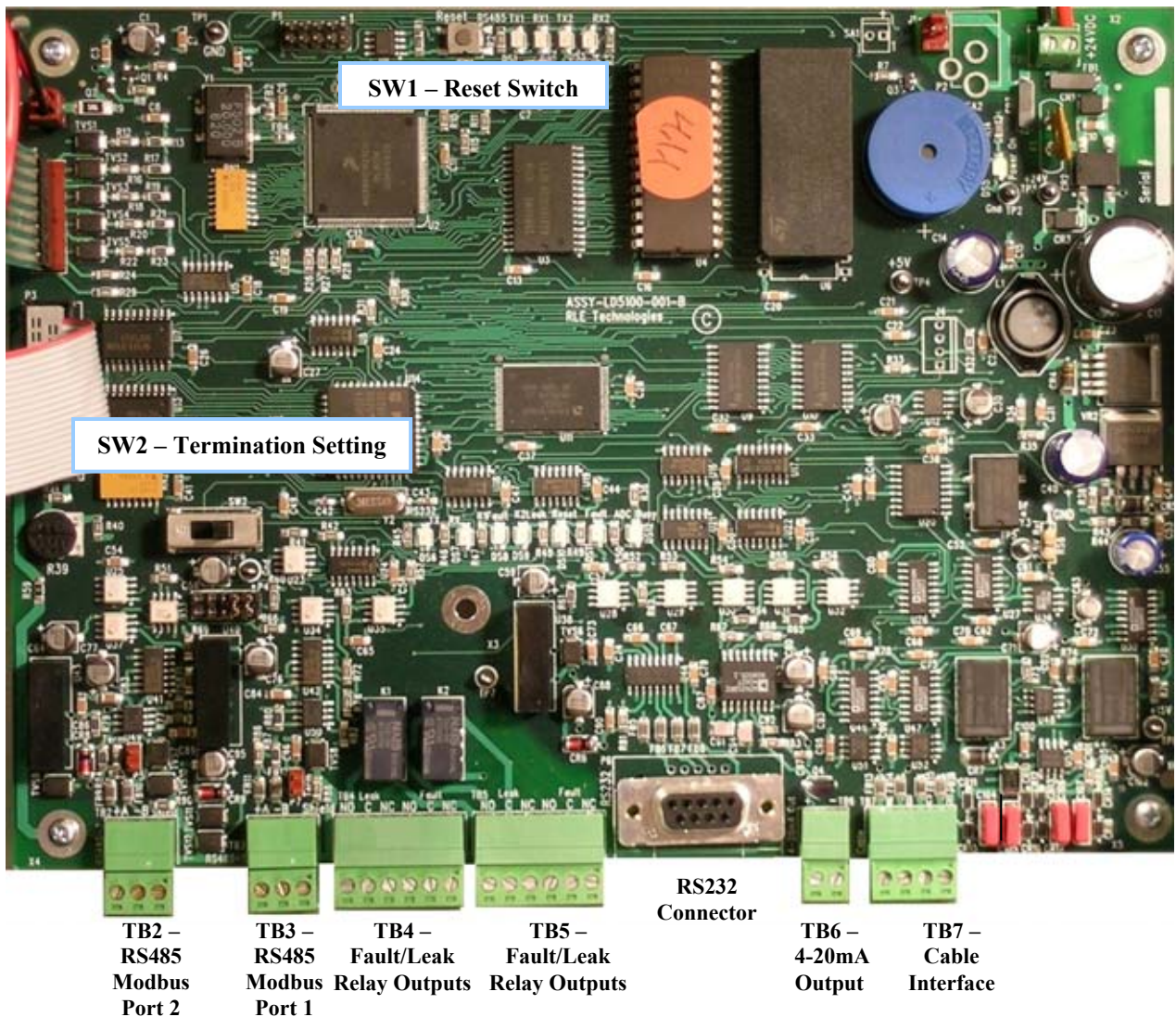


Figure 2-1 LD5100 Main Board

### 2-1 MAIN BOARD

#### 2-1.1 R39: Contrast

This dial adjusts the 160x160 LCD’s contrast. Turn the knob clockwise or counterclockwise to adjust the contrast as necessary.

### 2-1.2 **TB1: Input Power**

This is a factory wired two position connector with the following connections (for reference only):

TB1-1 24VDC negative (-)  
TB1-2 24VDC positive (+)

### 2-1.3 **TB2: RS485-2 Modbus Port 2**

TB2 connects to a RS485 network. A grounded shield contact is provided for connection to shielded cable. If the shield contact is used, verify the power connector is properly grounded and there is no voltage potential between units on the network. The RS485 port is set to no parity, 8 databits, 1 stop bit (n, 8, 1). Connect the RS485 wires to TB2 on the main board as follows:

TB2-1 A (+)  
TB2-2 B (-)  
TB2-3 Shield

### 2-1.4 **TB3: RS485-1 Modbus Port 1**

TB3 connects to a RS485 network. A grounded shield contact is provided for connection to shielded cable. If the shield contact is used, verify the power connector is properly grounded and there is no voltage potential between units on the network. The RS485 port is set to no parity, 8 databits, 1 stop bit (n, 8, 1). Connect the RS485 wires to TB3 on the main board as follows:

TB3-1 A (+)  
TB3-2 B (-)  
TB3-3 Shield

### 2-1.5 **TB4 & TB5: Relays**

Terminals TB4 and TB5 are Form C Relay Outputs. Each terminal has two outputs. TB4 provides a connection to one of the leak alarm relay outputs and one of the fault relay outputs; TB5 provides a second set of contacts for the same leak and fault alarms.

The six contacts on TB4 and TB5 are labeled **Leak NO**, **Leak C**, **Leak NC**, **Fault NO**, **Fault C**, and **Fault NC**. Connect the alarm relay wires to TB4 and TB5 as follows:

TB4-1 Leak alarm normally open (NO)  
TB4-2 Leak alarm common (C)  
TB4-3 Leak alarm normally closed (NC)  
TB4-4 Fault alarm normally open (NO)  
TB4-5 Fault alarm common (C)  
TB4-6 Fault alarm normally closed (NC)  
TB5-1 Leak alarm normally open (NO)  
TB5-2 Leak alarm common (C)  
TB5-3 Leak alarm normally closed (NC)  
TB5-4 Fault alarm normally open (NO)  
TB5-5 Fault alarm common (C)  
TB5-6 Fault alarm normally closed (NC)

Two LEDs, labeled **K1Fault** and **K2Leak**, are located above TB4 and TB5 in the LED status strip near the center of the main board. They indicate the status of the relays. The leak detection relay is activated when a leak is detected. The cable break relay is activated when a cable fault is detected.

Both relays (all alarms) can be configured to be latched or unlatched. A latched alarm requires a manual reset of the system once a leak or cable problem is no longer present.

### 2-1.6 **RS232 Connector**

The RS232 port uses only the transmit, receive, and ground pins (2, 3 and 5). The baud rate is 9600. The RS232 port is set to no parity, 8 databits, 1 stop bit (n, 8, 1). A straight through cable should be used to connect a terminal or PC to the LD5100.

### 2-1.7 **TB6: 4-20mA Output**

A 4-20mA loop powered output is provided on TB6. The maximum range (20 mA) can be set to 1000, 2500, or 5000 feet. Connect the 4-20mA wires to TB6 as follows:

TB6-1 4-20mA positive (+)  
TB6-2 4-20mA negative (-)

### 2-1.8 **TB7: Cable Interface**

The Water Leak Detection Cable connects to TB7. A fifteen-foot non-sensing leader cable is provided to connect the LD5100 to the Water Leak Detection Cable. Connect the cable wires to TB7 as follows:

TB7-1 White wire  
TB7-2 Black wire  
TB7-3 Green wire  
TB7-4 Red wire

## 2-2 **POWER BOARD**

### 2-2.1 **SW1: 115 / 230 VAC Input Selector Switch**

The LD5100 may be powered from either 115 VAC (105-125 VAC) or 230 VAC (205-250 VAC). Rotate SW1 to the desired voltage (line up the arrow to the corresponding dot above the voltage rating).

### 2-2.2 **TB3: AC Voltage Input**

The LD5100 mounted in the metal enclosure requires either a 115 VAC (105-125 VAC) or 230 VAC (205-250 VAC) connection (2 wire & ground). Connect a ground wire to the ring terminal mounted to the X4 screw. Connect the AC input as follows:

TB3-1 Neutral  
TB3-2 Line  
X4 Ground



## **WARNING!**

**Do not apply power until connections are complete!**

**Do not apply power unless voltage correctly corresponds to the SW1 Selector Switch!**

## CHAPTER 3: INSTALLATION

### 3-1 INSTALLING THE UNIT

The LD5100 is a wall mounted device. To secure the device to the wall, first remove the aluminum back panel and all electronics from the enclosure. There are knockouts on the top and bottom of the enclosure designed to accommodate .5" conduit. Remove as many as necessary. There are two holes in the top back of the unit spaced 11.0" apart. Use drywall anchors to secure the unit to the wall. Put two more drywall anchors through the two holes in the bottom back of the unit. Reinstall the back panel and reconnect the electronics.

### 3-2 CONNECTING THE WATER LEAK DETECTION CABLE

The LD5100 requires a leader cable (available in an 15' LC Kit). One end of this leader cable connects into the LD5100. This end of the cable has four stripped, bare wires. The other end features a mating connector which connects with the leak detection cable. The end of the cable is finished with a removable end terminator.

Connect the 15' leader cable to the LD5100. From left to right, with the screws of the terminal block connector facing up, the wires that screw into the terminal connector should be colored white, black, green, and red. If the terminal connector is removed from the end of the cable, make sure the wires are in this same order when the connector is reapplied.

Once the leader cable is plugged into the terminal blocks, it is ready to be connected to the leak detection cable. To do this, unscrew the end terminator from the end of the leader cable. Attach the first length of water leak detection cable to the leader cable. Route the water leak detection cable according to a cable layout diagram, if provided. Lay the cable according to the following guidelines on the next page. Secure the end terminator on the unoccupied end of the leak detection cable.

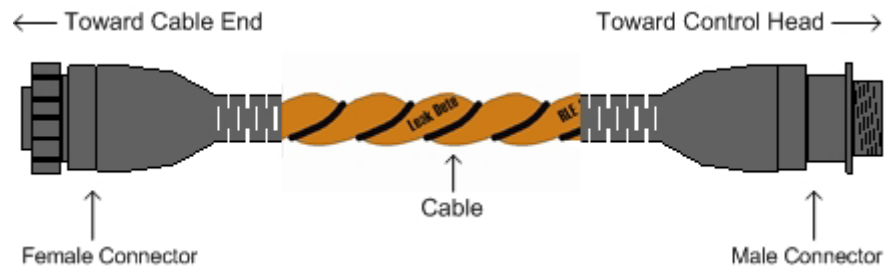


Figure 3-1 Water Leak Detection Cable

#### 3-2.1 Securing Cable to the Floor

Secure the cable to the floor with either J-clips or one of the other approved methods shown in Figure 3-2 Cable Installation Methods. J-clips are the manufacturer's recommended installation method and can be installed as follows:

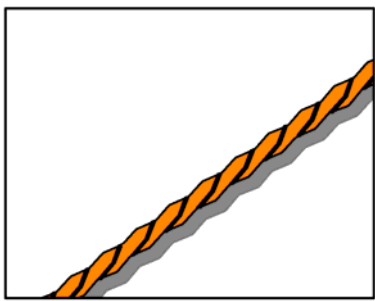
- Place one J-clip every three feet along the length of the water leak detection cable and one at each turn of the cable.
- If the cable is installed over an obstruction, clip the cable on both sides, as close to the obstruction as possible.

- Do not install the cable directly in front of an air conditioner. Allow a minimum of six feet between the unit and the cable. If the cable is too close to the air conditioning unit's air stream, the moisture from the humidifier may cause false leak readings. If the cable must be installed in front of an air conditioning unit, place the J-clips 12 to 18 inches apart.

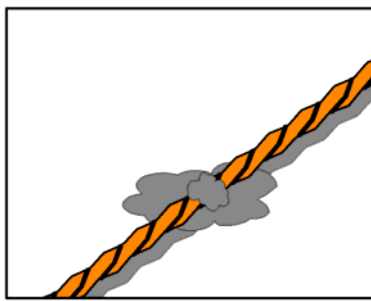


**NOTE:**

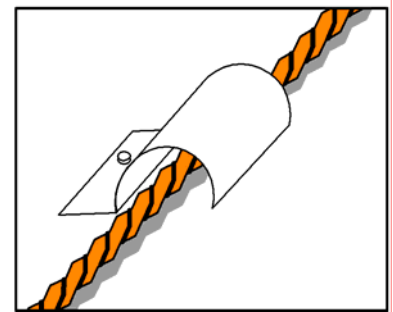
It is important to finish the end of the leak detection cable with the end terminator. If the end terminator is not present, a cable fault will register. Note any variances between the cable layout diagram and the actual cable installation.



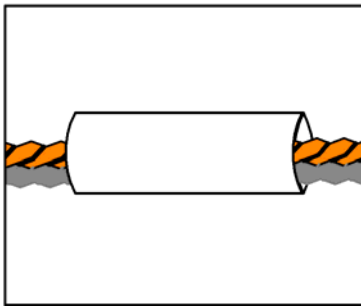
Laid freely on the floor.  
Only recommended in spaces with no access.



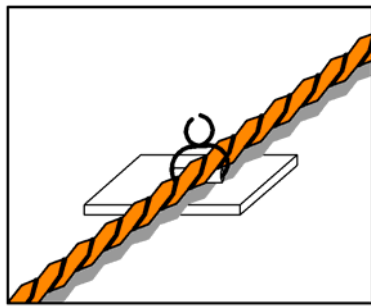
Secured to floor with mastic.



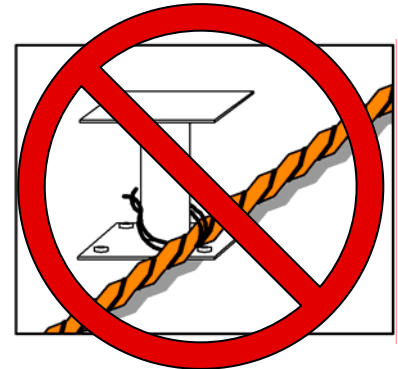
Installed in protective covering.



Secured to floor with J-clips.



Secured to floor with tie wrap.



Secured to pedestal with tie wrap.  
**Do Not Secure as Shown**

Figure 3-2 Cable Installation Methods

### 3-3 APPLY POWER TO THE UNIT

Once the leak detection cable is connected to the unit, power may be applied.



#### **WARNING!**

**A dedicated circuit breaker must be provided in the building within close proximity to the LD5100 and be clearly marked as the disconnecting device for this unit.**

The LD5100 operates on either 115VAC (105-125VAC) or 230VAC (205-250VAC) power. An AC power supply should be run to the location of the unit. Before applying power to the unit, make sure the AC breaker switch is turned off.

Once the power is turned off, strip the end of the AC supply so the three wires inside are exposed. Strip the end of each of the three wires and feed the end of the power supply into the LD5100 enclosure. The three wires must now be inserted into the terminal block in the lower right corner of the enclosure. As is labeled in the enclosure, the live power line is placed inside the right hand position of the terminal block (L). The Earth ground line is placed into the ring terminal block secured on mount X4. The neutral line is placed into the opening on the left side of the terminal block (N).

Once all the wires are placed inside the terminal block, turn the AC power supply back on. The LD5100 should begin booting upon power. Wait approximately one minute. No alarm should be present.

On the LCD, press any key for the main menu. Enter the **Cable Status** menu. The cable length is displayed. If this reading varies by more than  $\pm 5\%$  of the actual length of cable installed, verify the installation.

Through the LCD submenus, you may set the clock, system name, alarm configuration, feet/meters, etc.

Wait at least 30 minutes before calibrating the LD5100. Calibrate the LD5100 through the front panel System Setup menu.

Map the cable per the instructions in Chapter 6: Mapping the Cable beginning on page 19.

## CHAPTER 4: 4-20mA OUTPUT TESTING

The LD5100's 4-20mA output is loop powered and tested by the manufacturer. The manufacturer guarantees its performance upon delivery. Should the 4-20mA output need to be tested in the field, follow these steps. The following procedure is performed with the cable connected, unless otherwise indicated.

1. Remove the two position plug from TB6.
2. Remove any wires from the terminal and install a 200Ohm resistor to TB6-2. Then apply +24V to TB6-1 and ground of the 24V supply to the other side of the resistor.
3. Reinstall the plug on TB6.
4. With the system on and no alarms present, measure the DC voltage across the resistor. A value of 0.8VDC should register. This equates to 4mA, or normal operation.
5. Remove the water leak detection cable and wait for the unit to activate its cable trouble alarm. Measure the DC voltage across the resistor. A value of approximately 4.0VDC should be measured. This equates to 20mA, or a fault alarm. Reconnect the water leak detection cable.
6. Place water on the end of the water leak detection cable. Measure the DC voltage across the resistor. The value will be proportional to the length of cable measured by the LD5100. A value of approximately 4.0V, which equates to 20mA, will be read if the length of the cable is identical to the length read by the LD5100. Dry the cable.
7. Place water on the start of the cable. Measure the DC voltage across the resistor. A measurement of approximately 0.8VDC, or 4mA, should be measured. This corresponds to a leak at zero distance. Dry the cable.
8. Remove the resistor from the plug and reattach any wires as necessary.

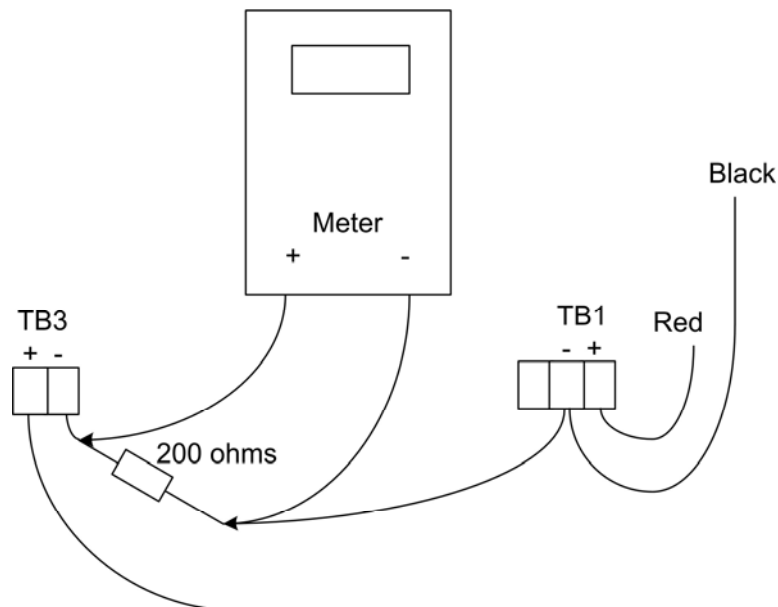


Figure 4-1 4-20mA Testing

## CHAPTER 5: LCD INTERFACE

### 5-1 DEFAULT / IDLE DISPLAY

When the LD5100 is powered up, diagnostics are performed. The boot ROM and flash program code are verified. While these diagnostics are being performed, the following text is displayed on the LCD:

```
*****
* LD5100 Bootup      *
* RLE Technologies  *
* Copyright 2006    *
*****

Diagnostics in progress ..
Bootloader running ..
Checking flash program ..
Running flash program ..
```

Once the diagnostics are complete, the LCD displays the following screen:

```
SeaHawk
LD5100

System Status:
Normal

12:34:56           01/01/07

www.rletech.com   Copyright 2007

Press Any Key For Menu
```

Any time a screen within the LCD interface is left idle for more than one minute, it will return to this default display.

The LCD is accompanied by a five button control panel. The **up**, **down**, **left** and **right** arrow keys are used to move the cursor through the display and change corresponding values. The **left** key often backs the display up one menu level at a time. Key legends will display at the bottom of the LCD in submenus. The **Enter** key selects an option and commits changes.

## 5-2 MAIN MENU

From the Main Menu, use the **up** and **down** arrow keys to position the arrow on the LCD in front of the appropriate menu choice. Press the **Enter** key to select a menu.

```

Main Menu
-----
>View Zones
  Cable Status
  Alarm History/Trend
  Comm Port Status
  View Map
  System Setup
  Zone Setup
  Point Mapping
  Comm Port Settings
  Reset

-----
Press ENTER to Select
Press LEFT to Exit

```

## 5-3 VIEW ZONES

The **View Zones** menu will display the available (or user configured) 12 zones of cable and their appropriate labels. These zones are lengths of cable that a user may configure for the LD5100 to display during an alarm.

Default / Unconfigured "View Zones" Menu:

```

Z#  StartingPoint,Label
-----
1:   0ft,
2:   0ft,
3:   0ft,
4:   0ft,
5:   0ft,
6:   0ft,
7:   0ft,
8:   0ft,
9:   0ft,
10:  0ft,
11:  0ft,
12:  0ft,

-----
Press LEFT to Exit

```

## 5-4 CABLE STATUS

The **Cable Status** option displays the Cable Status screen.

```

Cable Status
-----

System Status: Normal

Length:      5000 Feet
Current:     0 uA
ContamDly:   0/120
LeakDelay:   0/20
Leg1 Res:    14000
Leg2 Res:    14000
Cable Relay is off

Firmware Version: V4.0 B00

-----
Press LEFT to Exit

```

### 5-4.1 System Status

During a no alarm condition, the System Status will display Normal. The System Status will change during an alarm condition and display either a Leak or Cable Break alarm.

### 5-4.2 Cable Length

The length of cable installed on the LD5100, in either feet or meters.

### 5-4.3 Current

The current on the leak detection cable. A current will register if there is any conductive material (water) detected on the cable.

### 5-4.4 Contamination Delay

(ContamDly) The Contamination Delay is a counter that begins when the contamination trip point is passed (*see System Setup menu for configuration*).

### 5-4.5 Leak Delay

(LeakDly) The Leak Delay is a counter that begins when the Leak Trip Point is passed (*see System Setup menu for configuration*).

### 5-4.6 Leg 1 Resistance

(Leg1 Res) The resistance measured on the first of two legs of the water leak detection cable. Primarily used for advanced diagnostic purposes.

### 5-4.7 Leg 2 Resistance

(Leg2 Res) The resistance measured on the second of two legs of the water leak detection cable. Primarily used for advanced diagnostic purposes.

**5-4.8 Cable Relay**

The Cable Relay is used to simulate 2500 feet of cable on the LD5100. This is used when the water leak detection cable must be disconnected from the LD5100 unit for maintenance or adjustment without causing a cable break alarm (*see System Setup for activation of the Cable Relay*).

**5-4.9 Firmware Version**

This is the version of the firmware that is current installed and running on the LD5100.

**5-5 ALARM HISTORY / TREND LOG**

```

Alarm History / Trend Log
-----
>Alarm History
Trend

Erase Alarm History
Erase Trend log

-----
Press ENTER to Select
Press LEFT to Exit

```

**5-5.1 Alarm History Log**

The Alarm History Log displays the most recent 100 events recorded by the unit. Events are displayed in the following manner:

**Date Time****Description** *whereas:*

**Date** is the date the event occurred.

**Time** is the time at which the event occurred.

**Description** is a detail of the nature of the event.

**5-5.2 Trend Data**

The Trend Data displays the leakage current on the cable. One measurement is taken at the user set interval (1 min - 1440 min; factory default is 1440 min (1day)). The log retains the 288 most recent entries.

Analyzing the Trend Data can help determine the location of long term contamination build up (degradation), etc. on the cable. Press the **Esc** key to exit the Log/Data Menu and return to the Main Menu.

**5-5.3 Erase Alarm History**

Erase Alarm History will clear all events log in the history table.

**5-5.4 Erase Trend log**

Erase Trend log will clear all trend data logged in the trend table.

## 5-6 COMM PORT STATUS

The **Comm Port Status** menu displays the settings and diagnostics of both of the LD5100's RS485 Modbus ports. This screen will display each port's Modbus address and packets counters. Press **Enter** to reset all packet counters displayed.

```

Comm Port Status
-----
** Port 1 **
MB-Slave Adr: 000 9600b
InPkts:      0
MyPkts:      0
!MyPkts:     0
OutPkts:     0
CRC errs:    0
Misc errs:   0
** Port 2 **
MB-Slave Adr: 000 9600b
InPkts:      0
MyPkts:      0
!MyPkts:     0
OutPkts:     0
CRC errs:    0
Misc errs:   0
-----
LEFT = Exit/ENTER = Reset

```

## 5-7 VIEW MAP

The **View Map** option displays all currently mapped points of the LD5100 (*see Chapter 6: Mapping the Cable*).

## 5-8 SYSTEM SETUP (*PASSWORD PROTECTED*)

The **System Setup** option displays the System Setup menu. The default password is 1234.

```

Setup Menu
-----
>LeakTripPoint: 150 ua
ContamTripPoint: 50 ua
Leak Delay:     20 S
Contam Delay:   120 S
Re-Alarm Delay: 0 Hrs
Latching Alarms: No
Supervised Rlys: No
4-20MA Max Range: 5000 ft
Feet/Meters:    Feet
Language:        English
Cable Test Relay: Off
Restore Defaults: Cancel
Clock: 01/01/07 12:34:56
Res/Ft:
  5000 Feet/2.800 Ohms/Ft
-----
Press ENTER to Select
Press LEFT to Exit

```

**5-8.1 Leak Trip Point**

The Leak Trip Point option allows users to modify the leak detection trip point for the LD5100. This trip point helps the system to avoid false alarm readings.

**5-8.2 Contamination Trip Point**

The Contamination Trip Point option allows users to modify the contamination trip point for the LD5100. This trip point helps the system to avoid false alarm readings.

**5-8.3 Leak Delay**

The Leak Delay is a counter that must expire upon a leak alarm condition before an alarm will register. This counter can be set from 5 to 990 seconds.

**5-8.4 Contamination Delay**

The Contamination Delay is a counter that must expire upon a leak alarm condition before an alarm will register. This counter can be set from 5 to 990 seconds.

**5-8.5 Re-Alarm Delay**

The Re-Alarm Delay is a counter that, upon expiring, will re-annunciate the last silenced alarm condition. This counter can be set from 0 (disable) to 24 hours.

**5-8.6 Latching Alarms**

The Latching Alarms option allows the alarm relays to be set as latching or non-latching. A latched alarm requires a manual reset of the system once a leak or cable problem is no longer present.

**5-8.7 Supervised Relays**

The Supervised Relays option allows users to configure the Leak and Fault relays to be supervised or unsupervised. A supervised relay is normally activated and will deactivate upon alarm or loss of power.

**5-8.8 4-20MA Max Range**

The 4-20mA Max Range allows the user to select the cable range for the 4-20mA output. This value can be set to 1000, 2500, or 5000 feet.

**5-8.9 Feet / Meters**

The Feet/Meters option designates whether the LD5100's distance readings are displayed in feet or meters.

**5-8.10 Language**

The Language option designates whether the LD5100's LCD menus are displayed in English or French.

**5-8.11 Cable Test Relay**

The Cable Test Relay option activates the internal test circuit to simulate 2500 feet of cable. This allows the leak detection cable to be removed from the LD5100 without causing alarms. The Cable Test Relay will stay on for 300 seconds and a counter will be displayed.

**5-8.12 Restore Defaults**

The Restore Defaults option will reset all configurations back to the original factory defaults.

**5-8.13 Clock**

The Clock option allows users to set the time and date for the LD5100.

### 5-8.14 Resistance / Foot

The Res/Ft option allows users to precisely calibrate the LD5100. Users can adjust the ohms per foot until the cable length displayed matches the actual cable length installed. The default value is 2.800 ohms per foot.

### 5-9 ZONE SETUP

The Zone Setup menu will display a table of configured zones. A zone is a set length of cable that may have a name or description assigned to it. Upon alarm, if a leak distance falls within a zone's boundary, the zone's description will appear on the main screen. Zones are configured by entering the starting distance for the zone, followed by the zone label. The zone's end boundary is set by the next zone's starting distance.

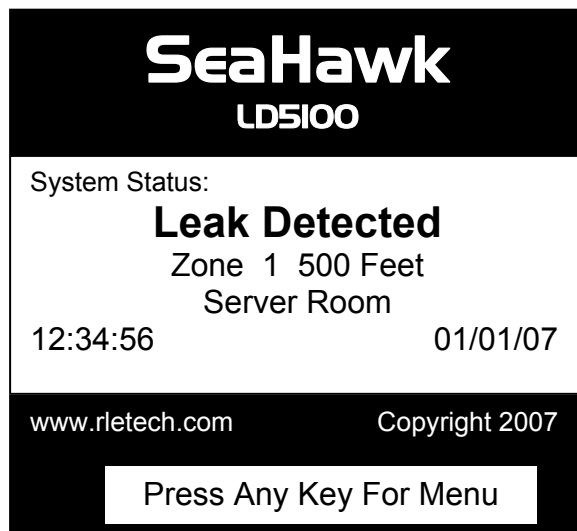
```

Zone Setup
-----
> 1:0000ft,Server Room
  2:1000ft,
  3:0000ft,
  4:0000ft,
  5:0000ft,
  6:0000ft,
  7:0000ft,
  8:0000ft,
  9:0000ft,
 10:0000ft,
 11:0000ft,
 12:0000ft,
Reset All

-----
Press ENTER to Select
Press LEFT to Exit

```

An example configuration for Zone 1 (*Note: Zone 1 starts at 0 feet and ends at Zone 2's starting distance*).



An example of the main screen during a leak at 500 feet, in Zone 1, labeled "Server Room".

## 5-10 POINT MAPPING

The Point Mapping menu allows users to map points on the LD5100. Mapped points help users to create reference maps for a cable layout. See *Chapter 6: Mapping the Cable* for more details about how to map the cable on the LD5100.

## 5-11 COMM PORT SETTINGS

The Comm Port Settings menu allows users to configure both of the LD5100's RS485 Modbus ports. The LD5100 is only configurable as a Modbus slave device. Both ports may have their addresses and baud rates set in this menu. Both addresses may be different and can be configured from 0 (disabled) to 254. Both baud rates may be different, as well, and can be configured as 1200, 2400, 9600 (default), or 19200.

```
Comm Port Setup Menu
-----
>Port1 Type: Modbus-Slave
Port1 Addr: 0
Port1 Baud: 9600
Port2 Type: Modbus-Slave
Port2 Addr: 0
Port2 Baud: 9600

-----
Press ENTER to Select
Press LEFT to Exit
```

## CHAPTER 6: MAPPING THE CABLE

After the water leak detection cable is laid in the desired configuration, the cable can be mapped. Mapping the cable improves the accuracy of the LD5100 and makes it easier to locate a leak.

The LD5100 computes the distance from the control panel to the leak along the length of water leak detection cable attached to the unit. In most cases, the water leak detection cable is laid in a curved or serpentine pattern. This may make it difficult to locate a leak when given a linear distance. To help alleviate this problem, identify a series of easily accessible, evenly spaced points along the cable length. Number the points, and record their locations on the leak detection reference map. Refer to the directions below and use the numbered points to map the cable. Then, when the unit detects a leak, the location of the leak can be determined by comparing the distance shown on the control panel with the known positions along the cable as recorded on the reference map.



### NOTE

**Calibrate the LD5100 prior to mapping by adjusting the Resistance per Foot reading (see Section 5-8.14 for more details). This allows the LD5100 measured cable length to accurately reflect the actual cable length installed.**

### 6-1 MAPPING DIRECTIONS

- 1) If a reference is not provided by RLE Technologies, create a drawing that represents the floor plan. This drawing must include the room layout (walls, doors, and other permanent structures), the water leak detection cable routing path, any jumper sections of non-sensing cable and any weighted cable connectors/simulators.
- 2) Physically identify points along the cable routing path. The points should be easily accessible and evenly spaced. Number the points and record their location on the reference map.
- 3) Using the front panel of the LD5100, select **Point Mapping** and press **Enter (↵)**.
- 4) To test, wrap a damp paper towel or sponge around the cable at one of the previously mapped points. The LD5100 produces a short beep within approximately 30 seconds. The LCD displays the LD5100's calculated distance to the leak. Remove the paper towel and dry the cable. Within approximately 20 seconds, the LD5100 produces a long beep indicating the short is removed and the system has returned to normal.



### TIP:

**If the individual mapping the cable is not in a position to hear the audible alarm, wait two minutes between each point. This ensures the system has had time to stabilize.**

- 5) Go to the next point and repeat the above steps until all points along the cable are mapped and tested.
- 6) When mapping is complete, press the **Left** key on the LD5100 to exit the mapping mode.
- 7) Select **View Map** on the LCD and record the LD5100's reading of each point on the reference map.
- 8) Mount the leak detection reference map alongside to the LD5100 control panel or the remote display. When a leak or cable break occurs, refer to the map and the distance displayed on the LD5100 to determine the physical location of the leak.



***WARNING!***

**Loss of power or re-entering the Point Mapping menu will cause all mapping data to be lost (reset).**

## CHAPTER 7: RS232 INTERFACE

The RS232 Interface is used primarily for advanced diagnostic and configuration.

### 7-1 BOOT UP

Make sure the RS232 port is connected to a PC or terminal with a straight through cable (not provided). Run terminal emulation software (i.e. HyperTerminal) and make sure the settings match the LD5100 RS232 port configuration (*see section 2-1.6 RS232 Connector for port configuration details*). When the LD5100 is powered up, diagnostics are performed. The boot ROM and flash program code are verified. Output similar to the screen displayed below should appear on the terminal or terminal emulation software.

```
LD5100 Boot V4.1.1
uP last reset by: external signal
Flash Mfg: 3030 / Device Id: 0000
AMD Flash Check: Flash Mfg: 0001 AMD / Device Id: 2258 29F800-B
Current Time: MON 01/22/07 11:31:00
Diagnostics in progress
Serials: Passed
Ram:      Passed
Clock:    Passed
Nvram:    Passed
Flash Blank Check: Boot = Data Parm1= Data Parm2= Data Prgm = Data
Flash Checksum - Calc: D7DA Actual:D7DA CS: Valid  Serial Num: 0001
PS 15V: 15.22 Passed
PS 24V: 21.4 Passed
Adc Calibrate CH1: passed CH2: passed
Test Resistor - Leg1: 1489h = 8042 ohms Leg2: 148Ch = 8046 ohms
(No Leak)      Leak) Cable Leakage: 3DEAh = 300 uA
(Near Leak) Cable Leakage: 3DE7h = 300 uA
Cable Test Far Leak Measurement Resistance: 1F9Fh Leak at: 8170 ohms
Cable Test Near Leak Measurement Resistance: 3FF7h Leak at: 4 ohms
Flash Code will start in 10 seconds
Press <ESC> to abort Flash Code
Checking flash program .. Running flash program 1
LD5100 V4.1 B06 01/23/07
SYSTEM BOOTED @ Mon 01/22/07 11:32:10

Copyright 2006, Raymond & Lae Engineering Inc.

Loading Block 1
DATA LOADED

<LD5100>
Cable length measured: 4700
```

## 7-2 MAIN MENU

Once the system is entirely booted, press the **Enter (↵)** key on your PC or terminal to display the Main Menu.

```

** LD5100 Help **
SC - System Configuration
LS - Leak Status
AR - Alarm ResTable (Leakage Current)
CT - Clear Trend Data Table
TI - Display Date/Time
MT ON - Measurement Trace On
MT OFF - Measurement Trace Off
MBT - Modbus Trace On
MBS - Modbus Stats
EX - Exit

```

## 7-3 SC - SYSTEM CONFIGURATION

The **SC** function command displays a submenu that lists all items in the System Configuration Menu.

```

LD5100 System Configuration Menu
1. Modify LCD Password
2. Zone Setup
3. Diagnostics
4. Exit
Enter Menu Selection >

```

### 7-3.1 Modify LCD Password - 1

Selection **1**, Modify LCD Password, will allow users to set a new LCD password for the System Setup LCD menu. A four digit number must be entered in place of the default 1234 password. A password of 0000 will disable all password protection on the LD5100.

### 7-3.2 Zone Setup - 2

Selection **2**, Zone Setup, will allow users to configure zones. Zones are lengths of cable that may have a label, or description, associated with them.

Zones begin by the **Zone Distance**, or starting length, and end with the next zone's beginning Zone Distance (*Note: Zone 1 always starts with Zone Distance of 0 ft.*). Enter a Zone Distance in the format **dxx** where xx is the zone number. A user will then be prompted to enter the beginning length for the zone. For example, to set Zone 2 to begin at 1000 feet, type **d2** and press **Enter**. Then type **1000** and press **Enter** when prompted for zone distance.

Enter a zone's description in the format **lxx** where xx is the zone number. A user will then be prompted to enter the description for the zone. A description can be up to fifteen characters in length.

### 7-3.3 Diagnostics - 3

Selection **3**, Diagnostics, will allow users to open the LD5100's Diagnostic menu. This menu is primarily used for advanced diagnostics and troubleshooting.

```
LD5100 Diagnostics Menu
1. Cable Readings
2. Set 4-20mA Output
3. Cable Relay On
4. Cable Relay Off
5. Output Relay K1 On
6. Output Relay K1 Off
7. Output Relay K2 On
8. Output Relay K2 Off
9. Exit
Enter Menu Selection >
```

#### 7-3.3.1 Cable Readings - 1

Selection 1 displays the current cable readings, including both cable length and any present current leakage.

#### 7-3.3.2 Set 4-20mA Output - 2

Selection 2 allows a user to manually set the 4-20mA output to test its function.

#### 7-3.3.3 Cable Relay On – 3

Selection 3 turns the internal cable test relay on.

#### 7-3.3.4 Cable Relay Off – 4

Selection 4 turns the internal cable test relay off.

#### 7-3.3.5 Output Relay K1 On – 5

Selection 5 turns the Leak relay on.

#### 7-3.3.6 Output Relay K1 Off – 6

Selection 6 turns the Leak relay off.

#### 7-3.3.7 Output Relay K2 On – 7

Selection 7 turns the Fault relay on.

#### 7-3.3.8 Output Relay K2 Off – 8

Selection 8 turns the Fault relay off.

### 7-4 LS - LEAK STATUS

LS displays the current cable readings, including both cable length and any present current leakage.

### 7-5 AR - ALARM RESET

AR resets all alarm relays. This command forces all alarms off. If an alarm condition is still present after the AR command is executed, the alarm is reactivated. If an alarm is still active after the AR command is executed, it will not be reentered in the Alarm History Log.

### 7-6 AH - ALARM HISTORY

AH displays the Alarm History Log.

### 7-7 CH - CLEAR ALARM HISTORY

CH clears the Alarm History Log.

**7-8 TD - TREND DATA TABLE**

**TD** displays the Trend Data Table, which monitors and displays leakage current.

**7-9 CT - CLEAR TREND DATA TABLE**

**CT** clears all records from the Trend Data Table.

**7-10 TI - DISPLAY DATE/TIME**

**TI** displays the LD5100's current date and time.

**7-11 MT ON - MEASUREMENT TRACE ON**

**MT ON** displays advanced manufacturer diagnostics of the microprocessor.

**7-12 MT OFF - MEASUREMENT TRACE OFF**

**MT OFF** turns off the display of advanced manufacturer diagnostics of the microprocessor.

**7-13 EX - EXIT**

**EX** is used to enter the Bootloader command section. The unit will stop monitoring cable and allow firmware updates to be loaded. To restore normal operation after updating firmware, type **RUN** and press the **Enter** (↵) key on the keyboard, or power the unit off and then back on again.

***Warning!***

The Bootloader section is designed for experienced technicians or users responsible for maintaining the system. Exit immediately if you are not trained in the use of the Bootloader commands.

Contact the manufacturer for more information regarding the commands in this section.

## **CHAPTER 8: MODBUS COMMUNICATION**

This document describes the Modbus communications protocol as supported by the LD5100 Water Leak Detection System. It includes details and information on how to configure the LD5100 for communications via Modbus network.

### **8-1 IMPLEMENTATION BASICS**

The LD5100 is capable of communicating via the half-duplex RS-485 serial communication standard. The LD5100 is configured to act as a slave device on a common network. The RS-485 medium allows for multiple devices on a multi-drop network. The LD5100 is a slave only device and will never initiate a communications sequence.

#### **8-1.1 Modes of Transmission**

The Modbus protocol uses ASCII and RTU modes of transmission. The LD5100 supports only the RTU mode of transmission, with 8 data bits, no parity and one stop bit. Every Modbus packet consists of four fields:

- Slave Address Field
- Function Field
- Data Field
- Error Check Field (Checksum)

##### **8-1.1.1 Slave Address Field**

The slave address field is one byte in length and identifies the slave device involved in the transaction. Valid address range is between 1 and 254. Dip Switch #1 sets the address. The firmware program constantly reads dip Switch #1. Any changes are updated on the fly. Close the SW1 positions that correspond to the binary number of the address.

##### **8-1.1.2 Function Field**

The function field is one byte in length and tells the LD5100 which function to perform. The supported functions are 03 (Read 4xxxx output registers), 04 (Read 3xxxx input registers), 06 (Preset single register) and 16 (Preset multiple registers).

##### **8-1.1.3 Data Field**

The data field of the request is a variable length depending on the function. The data fields for the LD5100 are 16-bit registers, transmitted high order byte first (big-endian).

##### **8-1.1.4 Error Check (Checksum) Field**

The checksum field lets the receiving device determine if the packet has transmission errors. The LD5100 RTU mode uses a 16-bit cyclic redundancy check (CRC-16).

#### **8-1.2 Exception Responses**

If a Modbus master sends an invalid command to the LD5100 or attempts to read an invalid register, an exception response is generated. The response packet will have the high order bit of the function code set to one. The data field of the exception response contains the exception error code.

**Table 1: Exception Codes**

Code	Name	Description
01	Illegal Function	The function code is not supported
02	Illegal Data Address	Attempt to access an invalid address
03	Illegal Data Value	Attempt to set a variable to an invalid value

## 8-2 PACKET COMMUNICATIONS FOR THE LD5100

### 8-2.1 Function 03: Read Output Registers

To read the LD5100 parameter values, the master must send a Read Output Registers request packet. The Read Output Registers request packet specifies a start register and the number of registers to read. The start register is numbered from zero (40001 = zero, 40002 = one, etc).

**Table 2: Read Output Registers Packet Structure**

Read Registers Request Packet	Read Registers Response Packet
Slave Address (1 byte)	Slave Address (1 byte)
03 (Function code) (1 byte)	03 (Function code) (1 byte)
Start Register (2 bytes)	Byte count (1 byte)
# of registers to read (2 bytes)	First register (2 bytes)
Crc Checksum (2 bytes)	Second register (2 bytes)
	...
	Crc Checksum (2 bytes)

**Table 3: Output Registers**

Register	Name	Description	Units	Range
40001	Leak Threshold	Trip current for leak alarm	uAmps	0-65535
40002	Contamination Threshold	Trip current for contamination alarm	uAmps	0-65535
40003	Re-Alarm	Re-Alarm delay	Minutes	0-65535
40004	Latched Alarm	Latching Alarms	0=No 1=Yes	0-65535
40005	Silence Alarm	Set to 1 to silence audible alarm	1=Silence	0-65535
40006	Reset Alarm	Set to 1 to reset alarms	1=Reset Alarm	0-65535
40007	Spare			0-65535
40008	Spare			0-65535
40009	Spare			0-65535
40010	Month	Clock	1-12	0-65535
40011	Day	Clock	1-31	0-65535
40012	Year	Clock	00-99	0-65535
40013	Hour	Clock	0-23	0-65535
40014	Minutes	Clock	0-59	0-65535
40015	Seconds	Clock	0-59	0-65535
40016	Seconds	Leak Alarm Delay	20-3600	0-65535
40017	Seconds	Contamination Alarm Delay	20-3600	0-65535

### 8-2.2 Function 04: Read Input Registers

To read the LD5100 input values, the master must send a Read Input Registers request packet. The Read Input Registers request packet specifies a start register and the number of registers to read. The start register is numbered from zero (40001 = zero, 40002 = one, etc).

**Table 4: Read Input Registers Packet Structure**

Read Registers Request Packet	Read Registers Response Packet
Slave Address (1 byte)	Slave Address (1 byte)
04 (Function code) (1 byte)	04 (Function code) (1 byte)
Start Register (2 bytes)	Byte count (1 byte)
# of registers to read (2 bytes)	First register (2 bytes)
Crc Checksum (2 bytes)	Second register (2 bytes)
	...
	Crc Checksum (2 bytes)

**Table 5: Input Registers**

Register	Name	Description	Units	Range
30001	Status	Bit Level Status	None	0-65535
30002	Leak Distance	Location of Leak	Ft/Meters	0-65535
30003	Units	Unit of Measure	1=Ft 0=Meters	0-65535
30004	Leak Current	Leakage current on cable	uAmps	0-65535
30005	Cable Length	Installed Cable Length	Ft/Meters	0-65535
30006	Loop1 Res	Resistance of cable	Ohms	0-65535
30007	Loop2 Res	Resistance of cable	Ohms	0-65535
30008	Res/Ft	Resistance of cable	Ohms x1000	0-65535
30009	Version	Firmware version	xx.xx X 100	0-65535

**Table 6: Status Flags (Register 30001):**

Bit	Description
00	1 = Leak is Detected
01	1 = Cable Break Alarm
02	1 = Contamination is detected
03-15	Spare

**8-2.3 Function 06: Preset Single Register**

To set a LD5100 parameter value, the master must send a Preset Single Register request packet. The Preset Single Register request packet specifies a register and the data to write to that register. The register is numbered from zero (40001 = zero, 40002 = one, etc).

**Table 7: Preset Single Register Packet Structure**

Preset Register Request Packet	Preset Register Response Packet
Slave Address (1 byte)	Slave Address (1 byte)
06 (Function code) (1 byte)	06 (Function code) (1 byte)
Register (2 bytes)	Register (2 byte)
Data (2 bytes)	Data (2 bytes)
Crc Checksum (2 bytes)	Crc Checksum (2 bytes)

### 8-2.4 **Function 16: Preset Multiple Registers**

To set multiple LD5100 parameter values, the master must send a Preset Multiple Registers request packet. The Preset Multiple Register request packet specifies a starting register, the number of registers, a byte count and the data to write to the registers. The register is numbered from zero (40001 = zero, 40002 = one, etc).

**Table 8: Preset Multiple Registers Packet Structure**

<b>Preset Registers Request Packet</b>	<b>Preset Registers Response Packet</b>
Slave Address (1 byte)	Slave Address (1 byte)
16 (Function code) (1 byte)	16 (Function code) (1 byte)
Start Register (2 bytes)	Start Register (2 bytes)
# of registers to write (2 bytes)	# of registers (2 bytes)
Byte Count (1 byte)	Crc Checksum (2 bytes)
Data (2 bytes)	
...	
...	
Crc Checksum (2 bytes)	

## 8-3 RTU FRAMING

The example below shows a typical Query/Response from a LD5100 module.

**Table 9: Query Sample**

<b>Slave Address</b>	<b>Function Code</b>	<b>Count Bytes of Data</b>	<b>Register Data Msb Lsb</b>	<b>Register Data Msb Lsb</b>	<b>Register Data Msb Lsb</b>	<b>CRC 16 "Lsb"</b>	<b>CRC 16"Msb"</b>
02	04	06	00 00	00 00	00 01	B5	A3

**Table 10: Response Sample**

<b>Slave Address</b>	<b>Function Code</b>	<b>Count Bytes of Data</b>	<b>Register Data Msb Lsb</b>	<b>Register Data Msb Lsb</b>	<b>Register Data Msb Lsb</b>	<b>CRC 16 "Lsb"</b>	<b>CRC 16"Msb"</b>
02	04	06	00 00	00 00	00 01	B5	A3

Slave address 2 responds to Function Code 4 with 6 bytes of hexadecimal data and ends with CRC16 checksum.

**Register Values:**

40001 = 0000 (hex)

40002 = 0000 (hex)

40003 = 0001 (hex)

## ***APPENDIX A: UPDATING FIRMWARE***

Firmware updates are available at [www.rletech.com](http://www.rletech.com) under the *Support* section. Download appropriate firmware to an accessible place to upload via RS232 (9600 baud, 8, N, 1) port through a PC or terminal (*see Chapter 7: RS232 Interface*).

### **A-1 UPDATING THE FLASH FIRMWARE.**

To start the update process, wait for the ten second delay window during power up and press “**ESC**” to stop the Flash Main Program from executing. Or if the Flash Main Program is already running, type “**EX**” to exit.

The Flash Main Program must be erased before an upload can be preformed. To erase the code, type the “**ERASE PRGM**” command. After a second or so, the screen will display “**OK**”. Next, type the “**LOAD PRGM XMODEM**” command. This will upload the new firmware file using X-Modem-1k protocol. The file must be binary with a .bin extension.

After the file has been uploaded, enter the “**RUN**” command, or power down the LD5100 and then turn it back on.

## ***APPENDIX B: PREVENTIVE MAINTENANCE***

Follow these steps monthly to test the system and ensure that the control panel is functioning properly:

- 1) Place water on the cable.
- 2) Verify the Leak Detected alarm on the control panel.
- 3) Compare the distance reading on the LD5100 LCD to the reference map to verify that the LD5100 displays the correct leak location.
- 4) Dry the cable and verify that the LD5100 returns to normal.
- 5) Remove the end-of-line terminator.
- 6) Verify the Cable Break alarm on the control panel.
- 7) Reinstall the end-of-line terminator.
- 8) Verify that the LD5100 returns to normal.

Monitor the cable current monthly to verify that the cable is not being contaminated. The LD5100 will alarm on cable contamination if the contamination is excessive.

- 1) From the LD5100 display, press the **“Enter”** key and navigate to the Cable Status menu.
- 2) Be sure the cable current is less than 25uA. If the cable current is greater than 25uA, it is recommended to troubleshoot the cables to determine which cable is contaminated. The contaminated cable should be removed, cleaned, retested and reinstalled.

## ***APPENDIX C: TROUBLESHOOTING***

<b>Trouble</b>	<b>Action</b>
<b>Control Panel will not Power Up</b>	<ol style="list-style-type: none"> <li>1) Check with a DVOM (multi-meter) for AC input power on the lower right hand terminal block on the Power board. If the Input Selector Switch is set for 115, voltage should be between 105 and 125 VAC. If the Input Selector Switch is set for 230, voltage should be between 205 and 250 VAC. If no AC power is present at terminal block, check the circuit (breaker) the LD5100 control panel is powered by. If voltage is present, go to step 2.</li> <li>2) Check for 24 VDC at terminal block TB1 pins 1 and 2. If no voltage is present across these pins, the Power board has failed. Contact RLE Technologies for replacement. If voltage is present and no LED's are illuminated, contact RLE Technologies for further troubleshooting.</li> </ol>
<b>Unit Powers Up without Proper Display on LCD</b>	<ol style="list-style-type: none"> <li>1) Open the front door and verify that the supply wires are connected to the display board (LCD panel).</li> <li>2) Check the R39 contrast Potentiometer located on the left middle section of the main board. Adjust the dial and verify that characters are appearing on the LCD. If the LCD is still not working, go to step 3.</li> <li>3) Check the ribbon cable attached to the display board. Verify that the connectors are all the way in place. If ribbon cable is in place and the LCD is still not displaying correctly, contact RLE Technologies for further support.</li> </ol>
<b>Cable Break Alarm</b>	<ol style="list-style-type: none"> <li>1) Verify that the leader cable from the water leak detection cable run is plugged into terminal block TB7.</li> <li>2) Verify that the end-of-line terminator is installed on the end of the orange sense cable run. If present at the end of the cable run, go to step 3.</li> <li>3) Remove the end-of-line terminator from the end of the cable run and install it onto the end of the leader cable coming from the control panel. If the condition clears, there is a damaged/faulty section of water leak detection cable. Start moving the end-of-line terminator to the end of each section of water leak detection cable to isolate the faulty section. If the condition does not clear, go to step 4.</li> <li>4) Power down (shut off) the control panel. Remove terminal block TB7 from the main board. Remove the four conductors from the leader cable wire going into the four position terminal block. Install a jumper wire between pins 1 and 2 and another jumper wire between pins 3 and 4. Reinstall the terminal block back into TB2. If the cable break condition clears, there is a problem with the leader cable. If the condition does not clear, contact RLE Technologies for further support.</li> </ol>

---

**Control Panel not Calculating  
Proper Length of Cable**

- 1) First verify the proper wiring order into terminal block TB7. Wiring color code should be as follows from left to right: White, Black, Green and Red.
  - 2) Calibrate your cable. To do this, adjust the Resistance per Foot (*see 5-8.14: Resistance / Foot on page 17 for details*). If the condition does not change, please contact RLE Technologies. The control panel is pre-calibrated from the factory. The overall footage should be within 5% of actual installed length.
- 

**Control Panel not Calculating  
Proper Leak Distance**

- 1) Check the distance on the cable run to verify that the control panel is monitoring. Verify there is no water along the cable run. Check to see if multiple leaks are present on the cable. The first leak should be read and latched by the system; however, if the system is updated or simultaneous leaks occur (2 or more) within 30 seconds of the initial leak, the system may display the average distance (distance of the first leak + distance of the second leak / 2). If no water is present, go to step 2.
  - 2) Power down (shut off) the control panel and remove the end-of-line terminator from the end of the sense cable. Locate the first section of sense cable from the LD5100 control panel. Where it joins to the second section of cable, disconnect and install the End-of-Line terminator at the end of the first section of sense cable. Turn power back on at control panel. Once the control panel runs for five to ten minutes, use a damp cloth, rag or paper towel and place it on the end of the orange sense cable. If the leak is calculated correctly, remove the end-of-line terminator; reconnect the sense cable and move down to the next section of cable. Repeat this process until a faulty reading is obtained. If the reading is off at the first section of cable, there may be miscalculations from the LD5100 unit, please contact RLE Technologies for support.
- 

**Cable Contamination Alarm Unit  
Displays: “Cable Contaminated  
@ XXXX Ft”**

- 1) To clear a contamination alarm, the cable must be removed and cleaned. Usually the cable can be cleaned by pulling it through a clean damp rag.
  - 2) If the cable is contaminated by oil, Glycol or chemicals, the cable can be washed. Use a mild detergent solution of 1 capful to 2 gallons lukewarm water (<105°F). Agitate the cable in a suitable container, rinse with clear lukewarm water and wipe dry with a clean towel. The cable may also be cleaned by wiping it down with Isopropyl Alcohol.
  - 3) Retest the cable by connecting it to the LD5100 before reinstalling it under the floor.
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**NOTE:**

Contamination and/or physical damage to the cable is not covered under warranty. For all other troubleshooting concerns and questions regarding this product, contact RLE Technologies.

## ***APPENDIX D: TECHNICAL SPECIFICATIONS***

<b>Power</b>	100/120/230-240VAC @ 500mA Max, 50/60 Hz
<b>Inputs</b>	
<b>Water Leak Detection Cable</b>	Each zone requires 1 LC-Kit: 15' (4.57m) leader cable and End of Line Terminator (EOL); LC-LKit not supplied (part #LC-KIT)
<b>Maximum Length</b>	5,000' (1,524m)
<b>Detection Accuracy</b>	± 2ft (0.6m)+/- 0.5% of the cable length
<b>Detection Repeatability</b>	± 2ft (0.6m) +/- 0.25% of the cable length
<b>Detection Response Time</b>	20-3600sec, software adjustable in 5sec increments; ±2sec
<b>Outputs</b>	
<b>Analog</b>	4-20mA Loop Powered, 18-36VDC, $R_L = 500\Omega$ max.
<b>Relay</b>	2 Form C Leak Relays, 2 Form C Cable Break Relays; 1A @ 24VDC, 0.5A resistive @ 120VAC; configurable for supervised or non-supervised, latched or non-latched
<b>Communications Ports</b>	
<b>RS-232</b>	9600 baud; No parity, 8 data bits, 1 stop bit
<b>RS-485</b>	1200, 2400, 9600 or 19200 baud (selectable); No parity, 8 data bits, 1 stop bit
<b>Protocols</b>	
<b>Terminal Emulation (RS-232)</b>	VT100 compatible
<b>Modbus (RS-485)</b>	Slave; RTU Mode; Supports function codes 03, 04, 06 and 16
<b>Alarm Notification</b>	
<b>Audible Alarm</b>	85DBA @ 2' (0.6m); re-sound 0-999min
<b>Logging Capabilities</b>	
<b>Event Log</b>	Last 512 events
<b>Trend Log</b>	Cable current level every day, for the last 288 days
<b>Login Security</b>	
<b>Terminal Emulation Access</b>	None
<b>Display Access</b>	1 Administrator (password for configuration, no password required to view panel status)
<b>Front Panel Interface</b>	
<b>Display</b>	Graphic, 160x160 pixel resolution backlit LCD with contrast adjustment
<b>Push Buttons</b>	Right, left, up, down, enter
<b>LED Indicators</b>	1 bi-color Power/Status (green=power on, red=alarm)
<b>Operating Environment</b>	
<b>Temperature</b>	32° to 122°F (0° to 50°C)
<b>Humidity</b>	5% to 95% RH, non-condensing
<b>Altitude</b>	15,000' (4,572meters) max.
<b>Storage Environment</b>	-4° to 158°F (-20° to 70°C)
<b>Dimensions</b>	10.0"W x 12.6"H x 3.25"D (254mmW x 320mmH x 82.5mmD)
<b>Weight</b>	10 lbs. (4.53kg)
<b>Mounting</b>	Wall mount Enclosure
<b>Certifications</b>	CE; ETL listed: conforms to UL STD 61010A-1, EN STD 61010-1; CAN/CSA C22.2 STD NO. 1010-02; RoHS Compliant



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