LD2100
User Guide

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www.rletech.com   RLE Technologies   800.518.1519

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Revision History

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2.7	September 2015		

Manufacturer's Notes

This product is manufactured by RLE Technologies, 104 Racquette Drive, Fort Collins, CO, 80524.

If this product is used in any manner other than that specified by the manufacturer, the protection provided by the equipment may be impaired.

Product Warranty

Warranty information for RLE products can be found at www.rletech.com.

Product Registration

Product registration helps RLE Technologies inform owners of:
- Product upgrades
- Firmware enhancements
- New products and technologies
- Special offers available only to registered users

Any information provided to RLE Technologies through the registration form will be regarded as confidential. RLE will not sell or distribute any of the information to third parties.

Technical Support

Before you install an LD2100, refer to RLE Technologies' website, www.rletech.com, to ensure you are using the most recent version of all documentation.

Personal assistance is available Monday through Friday, from 8:00 a.m. to 5:00 p.m. MST.

A request for assistance may be sent to support@rletech.com.

Otherwise, please call us directly at: **800.518.1519**.

The following information is located on the bottom of each LD2100 unit. Please have this information available whenever a technical support call is placed:

Product Model Number _____

Product Serial Number _____

Product Manufacture Date _____

The LD2100 is not a field-serviceable item and must be sent back to RLE Technologies for mechanical repair. Power must be disconnected (unplugged) from the LD2100 any time the unit is mechanically serviced. Physically unplug power from the unit any time you are making wiring connections to or from the LD2100.

RLE cannot accept an item for repair without a Return Materials Authorization number, which must be provided by RLE.

LD2100 User Guide

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PRODUCT OVERVIEW

1.1. Description

The LD2100 is a complete monitoring system that reports the presence of water and other conductive liquids.

The LD2100 is an advanced controller that operates in conjunction with SeaHawk sensing cable and SeaHawk spot detectors. Each LD2100 monitors up to 5,000 feet (1524m) of sensing cable. When a conductive liquid comes in contact with the sensing cable or spot detector, the distance to the leak is shown on the LD2100's front panel display.

Alarm notifications are distributed via user-configurable Modbus (EIA-485 or TCP/IP), BACnet (IP), SNMP, SMTP (email), or relay output to an alarm panel.
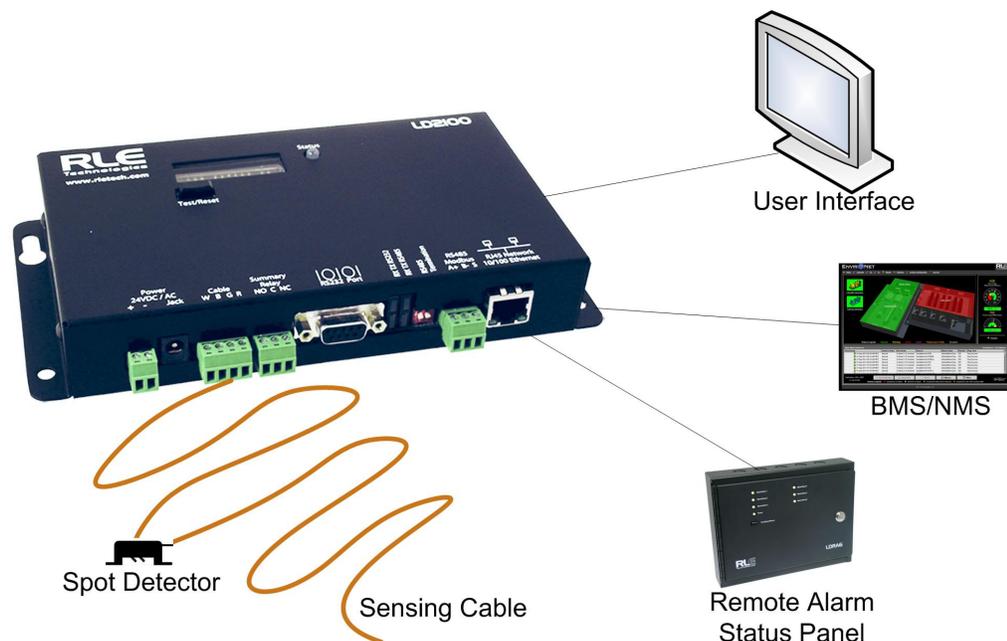
Figure 1.1   LD2100 Leak Detection and Communication

1.2. Operation

Supervised System

The LD2100 is a *supervised system — it* continually monitors the leak detection cable and spot detectors for continuity. In addition to a leak triggering an alarm condition, a cable break or excess contamination of the cable causes a cable fault indication and activates a relay. The LD2100 sends alarm notifications to predetermined recipients when an alarm sounds. The LD2100 produces an alarm during the following conditions:

♦ Leak detection

♦ Cable break

♦ Cable contamination

Distance-Read Leak Detection

When the LD2100's circuitry measures a current in excess of the user-defined leak threshold, the unit's microprocessor computes the distance to the leak. The LD2100 then annunciates the leak and logs the alarm in its event log. The summary relay has one output.

User Communication

A Web-based user interface provides information about the LD2100's conditions. The user interface can be used on site or remotely via network communications. The chapters and appendices in this manual describe how to use the interface to accomplish specific configuration and operation tasks.

The LD2100 also provides Modbus outputs via EIA-485, twisted-pair wire, or TCP/IP, as well as BACnet/IP or BACnet/MSTP and SNMP outputs.

2

INSTALLATION

Installing the LD2100 involves mounting it to a wall in the appropriate location and making the necessary connections for power, leak detection, and communications.

2.1. Prepare for Installation

Before installing the LD2100, have the following supplies available:

Included with the LD2100

♦ Wall mount kit (or purchase optional enclosure, LD-ENC)

♦ 15ft. (4.57m) leader cable

♦ End-of-line terminator (EOL)

Available from RLE, Sold Separately

♦ SeaHawk sensing cable

♦ Non-sensing cable, other accessories

♦ Isolated power supply - 24VDC (PSWA-DC-24) or 24VAC (WA-AC-24)

Additional Supplies and Information Required

♦ Crossover network cable

Consult with your IT administrator to determine the following network settings for the LD2100:

♦ IP address

♦ Subnet mask

♦ Default gateway

2.2. Controls and Displays

The front of the LD2100 contains the following controls and displays:

Item	Description

Digital LED display	• **In a normal operating state**, this LED displays the `LD2100` product name with a spinning bar (|) to the right of the name.
	• **In an alarm state**, the LED displays information about the alarm condition; for example, if a leak is detected, the LED displays a message with a leak detection cable distance included. For example:
	`Leak detected`
	`250 uA`
	`at 675 ft (`**or** `205.74m)`
	
	Note: Current range for a leak: 235 – 302 uA

Status LED	**Green**: The LD2100 is powered on and in a normal operating state. **Red**: The LD2100 is in an alarm state.

Test/Reset button	**If an alarm is sounding**, briefly pressing the button turns off the audible alarm. The Status LED remains red, and the digital LED display continues to show the alarm condition.
	In an alarm condition, whether the alarm is sounding or not, pressing and holding this button clears the alarm.
	In normal operating conditions, pressing the Reset button causes the display to cycle through four lines:
	`LeakageC`
	`nnnn uA`
	`Length`
	`nnn ft (or nnn m)`
	After a short pause, the LD2100 returns to the default display or continues to display the alarm, depending on the value entered in the Re-Alarm Interval field on the Leak Settings web page (see Table 3.2, "Leak Configuration Options" on page 30 for more information).

Table 2.1   LD2100 Controls and Displays

2.3.   **Physical Connections**

The LD2100 has the following physical connections:
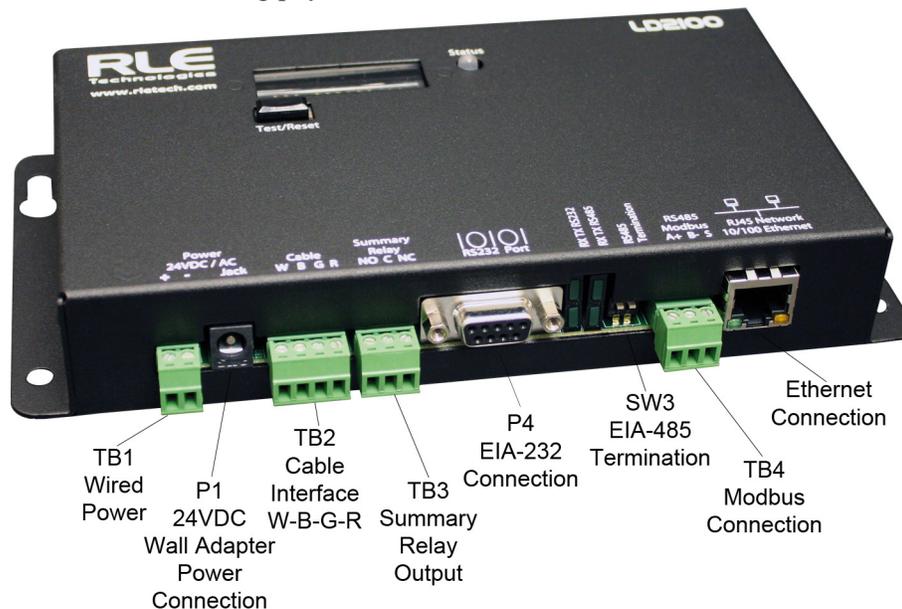
Figure 2.1   LD2100 Connections

TB1: Input Power

The LD2100 requires an isolated power supply, either RLE part PSWA-DC-24 or WA-AC-24. Power can be wired to the LD2100 through TB1. Wire the connections as follows:

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

P1: Input Power

The LD2100 requires an isolated power supply. Power supplies are available from RLE and are not included with the LD2100. Contact RLE directly to purchase either RLE part number PSWA-DC-24 (24VDC isolated power supply) or WA-AC-24 (24VAC isolated power supply).

To learn more about connecting power to the LD2100, refer to Section 2.6., "Apply Power to the LD2100" on page 19.

TB2: Cable Interface

SeaHawk sensing cable connects to TB2. Since sensing cable cannot connect directly to a leak detection controller, the 15-foot (4.57m), non-sensing leader cable (supplied with the LD2100) must be connected to TB2, and then the sensing cable connected to the leader cable; see Section 2.5., "Connect the SeaHawk Leak Detection Cable" on page 17.

TB3: Summary Relay

Terminal TB3 is a Form C summary relay output. This relay provides alarm notification when a leak, cable fault, or cable contamination is detected.

The contacts on TB3 are labeled NO, C, NC. Connect the alarm relay wires to TB3 as follows:

TB3-1 Leak alarm normally open (NO)
TB3-2 Leak alarm common (C)
TB3-3 Leak alarm normally closed (NC)

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.

P4: EIA-232 Connector

The EIA-232 uses a baud rate of 9600. The EIA-232 port is set to 8 databits, no parity, and 1 stop bit (8, N, 1). A straight through cable is used to connect a terminal or PC to the LD2100. This connection should only be used for setting the IP address, using advanced diagnostics, uploading firmware, and troubleshooting. Detailed IP configuration instructions can be found in Section 2.7., "Configure Communication through the Ethernet Port" on page 20.

SW3: EIA-485 Termination

Switch SW3 is used when the LD2100 is the last unit on a EIA-485 network. Switch SW3 on (push to the down position) to place a termination resistor across the + and - terminals of the EIA-485 port.

TB4: EIA-485 Modbus Port

TB4 connects to an EIA-485 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 EIA-485 port has a selectable baud rate (9600, 19200, or 38400) and is set to 8 databits, no parity, and 1 stop bit (8, N, 1). Connect the EIA-485 wires to TB4 as follows:

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

P3: RJ45 Network

A 10/100 BaseT Ethernet connection allows the LD2100 to connect directly to a local area network. Use a crossover cable for initial connection and configuration. The default settings are as follows:

IP Address: 10.0.0.188
Subnet Mask: 255.255.255.0

2.4.   Mount the LD2100

The LD2100 is a wall mounted device. Using the wall mount kit (screws and reinforcers, included) or the LD-ENC wall-mountable enclosure (sold separately), mount the device to the wall in a convenient location.

2.5. Connect the SeaHawk Leak Detection Cable

The LD2100 is shipped with a 15-foot (4.57m) leader cable. Since sensing cable cannot connect directly to a leak detection controller, one end of this leader cable connects to the LD2100 controller, and the other end connects to the SeaHawk sensing cable. Connect each end of the leader cable as follows:

1 With the screws of terminal block connector TB2 on the LD2100 facing up, connect the four stripped, bare wires of the leader cable to the terminals in this order, from left to right: white, black, green, red.

Note   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.
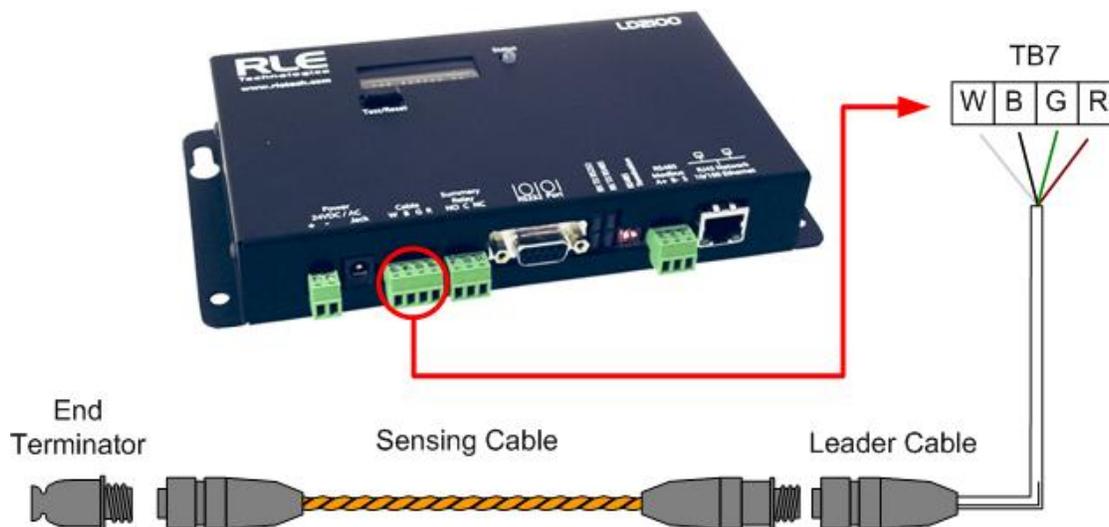
Figure 2.2   Connecting the Sensing Cable

2 Unscrew the end-of-line (EOL) terminator from the other end of the leader cable.

3 Attach the first length of sensing cable to the leader cable.
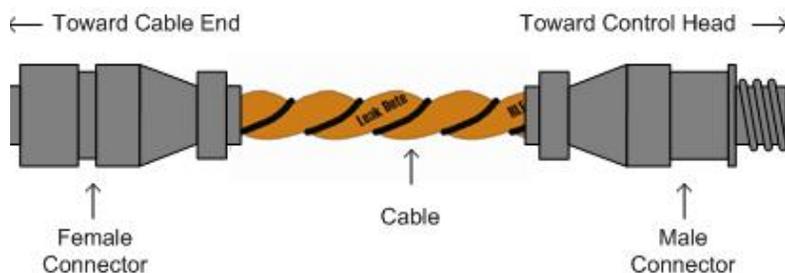
Figure 2.3   SeaHawk Sensing Cable

4 Route the sensing cable according to a cable layout diagram. Attach additional lengths of sensing cable as needed.

5 Secure the EOL terminator to the unoccupied end of the sensing cable.

Note   If the EOL terminator is not present at the end of the cable run, a cable fault will register.

6 If you are using a reference map, compare it with the actual cable installation. Revise any discrepancies created through the physical installation of the cable.

2.5.1 Secure Sensing Cable to the Floor

Secure the sensing cable to the floor with either J-clips (RLE part #JC), or one of the other approved methods shown in Figure 2.4. Available from RLE and designed specifically for use with sensing cable, J-clips are the manufacturer's recommended installation method.

♦ Do not use conductive materials, such as Fire Block or caulk, on the sensing cable.

♦ To avoid contaminating the cable, clean the entire floor as much as possible. Use isopropyl alcohol to clean the spots on the floor where the J-clips will be placed.

♦ Place one J-clip every 5 to 6 feet (1.52 to 1.83m) along the length of the sensing cable and one at each turn of the cable. Use more J-clips if a tighter configuration is required.

♦ If the cable is installed over an obstruction, clip the cable on both sides, as close to the obstruction as possible.

♦ The J-clip's adhesive backing does not work well on porous concrete floors. RLE recommends using a drop of silicone or another nonconductive adhesive to help secure the J-clip to the floor.

IMPORTANT   Do not install the cable directly in front of an air conditioner. Allow a minimum of 4 to 6 feet (1.22 to 1.83m) 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 36 inches (0.91m) apart.
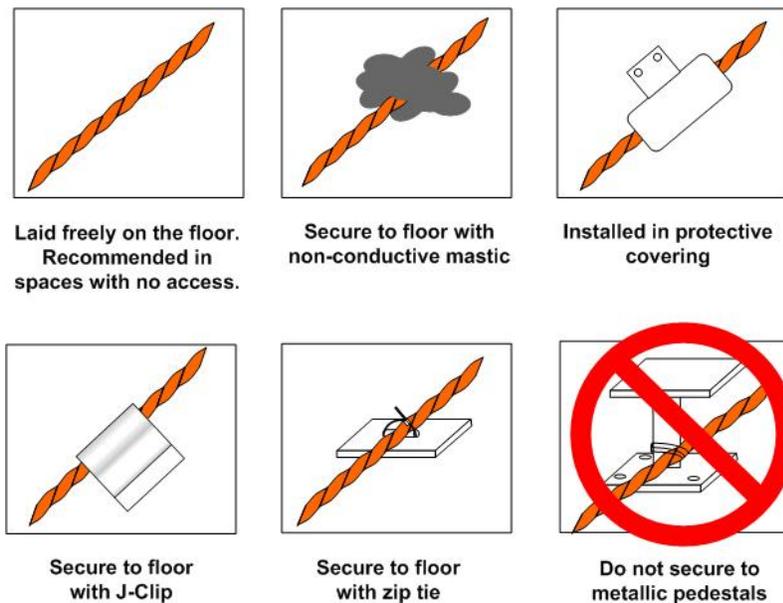
Figure 2.4   Secure the Cable

2.6.   Apply Power to the LD2100

⚠️ **WARNING**

An isolated power supply must be provided for the LD2100.

Do not connect 120/230 VAC to the unit, or damage will occur to the circuitry.

1 The LD2100 requires an isolated power supply. If you wish to use 24VDC power, the LD2100 requires RLE power supply PSWA-DC-24 (not included - purchase separately from RLE). If you wish to use 24VAC power, the LD2100 requires RLE power supply WA-AC-24 (not included - purchase separately from RLE). Run an isolated power supply to the location of the unit.

2 Connect power to either the TB1 or P1 connector on the side of the LD2100. If you are using TB1, you may need to cut the barrel connector off your power supply and strip the ends of the wires so they can be inserted into the terminal blocks.

3 Before applying power to the unit, ensure that all connections are correct and all screw terminals are secure.

The LD2100 begins booting when power is applied. The normal operating condition of the LD2100 is for the Status LED to glow green and for the LED display to show `LD2100` with a spinning bar (|) to the right of the product name.

4 Wait approximately one minute for the LD2100 to start up. No alarm should be present. If an alarm is present, consult Appendix 7 for troubleshooting information.

5 Go to the LD2100's user interface to verify the length of the installed leak detection cable. See Section 2.7., "Configure Communication through the Ethernet Port" on page 20 to set up network access to the LD2100. See Chapter 3 for instructions for verifying the length of the installed cable.

2.7. Configure Communication through the Ethernet Port

IMPORTANT Consult your IT administrator before performing these steps. If you intend to change the IP Address or Subnet Mask, obtain appropriate addresses from your IT department.

LD2100 default IP address: 10.0.0.188
LD2100 default subnet mask: 255.255.255.0

2.7.1 Access the Configuration Menu

RLE recommends using the web-based Configuration Menu to configure communications for the LD2100. If you'd like to use the EIA-232 interface to access the LD2100, refer to Section 2.8., "Configure Communications Through the EIA-232 Port" on page 22.

1 Plug a crossover cable into the computer that will be used to configure the LD2100.

Note This cable is not intended to be connected to a network hub, and will not work if it is connected to a hub.

2 Connect the other end of the crossover cable to the Ethernet port on the back of the LD2100.

Note Alternatively, you could use the LD2100's EIA-232 interface to access the LD2100. See "Configure Communications Through the EIA-232 Port" on page 22.

3 Write down the computer's current IP address, subnet mask, and default gateway. Change these items temporarily so that the computer can communicate with the LD2100.

4 Access the LD2100 through a Web browser by typing the LD2100's default IP address (10.0.0.188) into the location bar and pressing Enter.
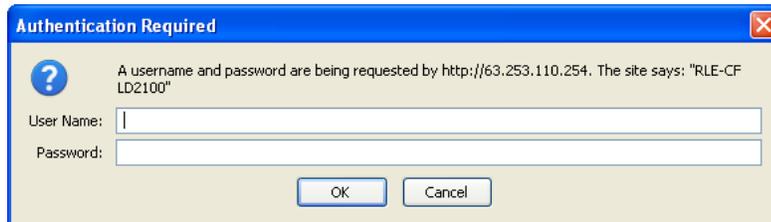
Figure 2.5 LD2100 Log In Prompt

5 Enter the following:

Default User Name: ld2100 (case sensitive)
Default Password: (No default password. Leave this field blank.)

Once you enter this information, the home page for the LD2100's web interface displays.

2.7.2 Configure Network Communications

To configure network communication, set the IP address for the LD2100 to the address assigned by your IT administrator.

1 From the home page of the LD2100's web interface, select the Configuration Menu link. Then, select Network Settings from the Configuration Menu.
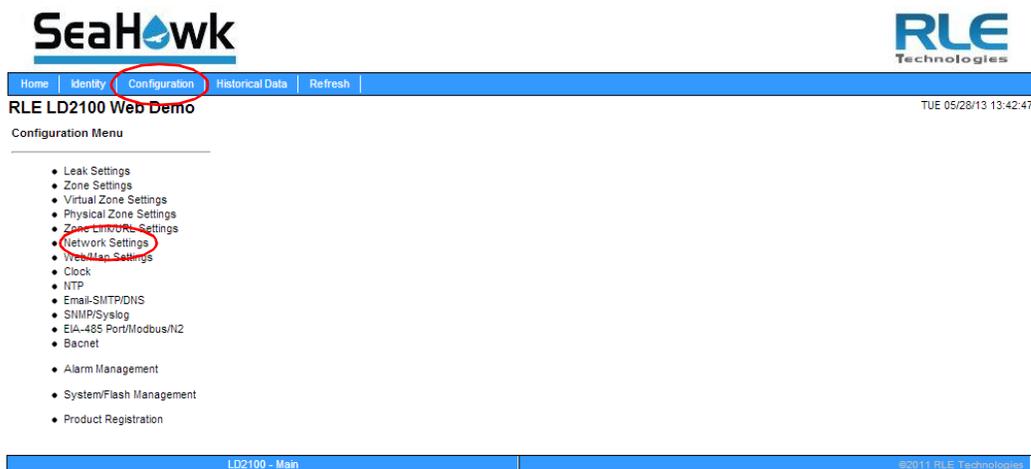
Figure 2.6 Configuration Menu

2 The Network/IP Configuration page displays. Enter the values for IP Address, Net Mask (subnet mask), and Def Route (default gateway) provided by your IT administrator.

Once you enter the values and click the Submit Changes button, the LD2100 saves the changes and reboots. The system status LED on front of the LD2100 stops flashing.

Figure 2.7 Network/IP Configuration Page

3 Reset the computer that's connected to the LD2100 to its original IP address and subnet mask. Disconnect the crossover cable.

The computer and the LD2100 are now both configured to communicate on the network.

4 To verify that the IP address on the LD2100 has been successfully changed, type the new IP address of the LD2100 into any web browser.

5 When prompted, enter the user name and password to verify network access to the LD2100 (as you did in step 4 in the previous section).

If the login window for the LD2100 does not display:

a Verify that all cables are firmly attached.

b Verify that you entered the correct IP address for the LD2100.

c Verify that the Status light on the top of the LD2100 is green.

For further troubleshooting information, refer to Chapter 7.

2.8. Configure Communications Through the EIA-232 Port

You can also use the EIA-232 interface to set the IP address:

1 Connect the EIA-232 port (P4) on the LD2100 to a terminal or PC running terminal emulation software (HyperTerminal) with a 9-pin male-female straight through serial cable.

2 2. Set the appropriate communication port to **9600 baud**, **NO parity**, **8 data bits**, **1 stop bit**, **(9600/N/8/1)**, and **no software or hardware flow command**.

3 Once the terminal emulation software starts, type ? and press **Enter** on the keyboard and the Main Menu should appear. If the Main Menu does not appear, check the communication settings and make sure the unit is powered on.

4 From the Main Menu type **netcfg** to select the Network Configuration Menu.

◆ Enter the new IP address for the LD2100 by typing ip xxx.xxx.xxx.xxx, where xxx.xxx.xxx.xxx is the new IP address of the unit. Separate each field with a decimal point. For example, type ip 10.0.0.50 <Enter>.

◆ The LD2100 erases a memory block and copies data to flash memory before rebooting.

◆ The LD2100 IP address is now set and the LD2100 can be accessed through a Web browser using the new IP address.

5 Repeat step 4¨ to change the Subnet Mask and Def Route, if needed, using the commands nm xxx.xxx.xxx.xxx to change the Subnet Mask and dg xxx.xxx.xxx.xxx to change the default gateway.

2.9. Calibrate Cable Resistance

Distance-read leak detection systems are resistance-based. RLE's sensing cables have a base resistance of 2.8 ohms/foot. The resistance of each length of sensing cable may be slightly more or less than the base resistance due to manufacturing variances. For this reason, the cable length displayed on the home page of the web interface may be slightly more or less than the actual length of cable installed.

A system configured using base resistance values will still be very accurate. If you wish to fine tune the resistance value of your LD2100 system to make it more precise, you may do so. This will increase the accuracy of the system, and bring the LD2100's reported installed cable length value in line with the actual length of cable installed.

1 Ensure the LD2100 has been powered and has all the sensing cable attached to it, with no alarms present.

2 Gather and record the following data from the home page of the web interface:

Cable Length (as reported by the LD2100)	
Cable Current	
Leg 1 Resistance	
Leg 2 Resistance	

Record the resistance per foot setting, as reported by the LD2100. This can be found on the Leak Configuration page of the web interface (Configuration > Leak Settings).

Reported Resistance per Foot	

3 Note the actual (physical + simulated) length of cable physically connected to the system. For your reference:

- ◆ WCCS simulates 50 ft.
- ◆ SDZ simulates 50 ft.
- ◆ XCON simulates 150 ft.
- ◆ Nonsensing cable does not add any length to a system

Record this sum:

Actual length of cable connected to LD2100	

4 Verify the current reading on the cable from the recorded value above. This value must be less than 15 µA in order to calibrate the system. If the current is higher than 15µA, clean the cable. Isopropyl alcohol works well to remove any contamination that might have gotten onto the cable during installation.

5 To calculate the most accurate resistance value for the system, divide the reported cable length by the actual cable length, and multiply the quotient by the reported resistance.

$$\left(\frac{\text{Reported Cable Length}}{\text{Actual Cable Length}} \right) \times \frac{\text{Reported}}{\text{Resistance}} = \frac{\text{New}}{\text{Resistance}}$$

For example:

Cable Length (as reported by the LD2100)	391 feet
Cable Current	0 μA
Leg 1 Resistance	1088 Ohms
Leg 2 Resistance	1095 Ohms
Reported Resistance	2.800 Ohms/foot

One 15 foot leader cable (leader cable does not count toward the total length of cable installed), one weighted cable connector (simulates 50 feet of cable), and one 330 foot section of cable are connected to the system.

Actual length of cable connected to LD2100 0 feet + 50 feet + 330 feet	380 feet

$$\left(\frac{391 \text{ feet}}{380 \text{ feet}} \right) \times \quad 2.800 \text{ Ohms} \quad = \quad 2.881 \text{ Ohms/foot}$$

The actual resistance of the cable installed with this LD2100 is 2.881 ohms per foot.

6 Go to the Leak Configuration page (Configuration>Leak Settings) and enter the newly calculated Resistance Per Foot value. Click Submit Changes once you have made all your changes to this web page.

When using the web interface, remember to click the Submit Changes button to save the adjusted resistance value.

In our example, adjusting the resistance value changed the reported cable length from 391 feet to 380 feet. This improves the accuracy of the system because the reported cable length more closely matches the physical length of cable connected to the system.

2.10. Test the System

Now that the system is calibrated, test a few spots before mapping the system.

Note If the LD2100 is already connected to a BMS or NMS, notify monitoring personnel before you begin testing the system.

1 To verify the LD2100's accuracy, test three points within the length of sensing cable - one at the beginning, one in the middle of the length, and another near the end of the length of cable.

There are a variety of ways to simulate a leak:
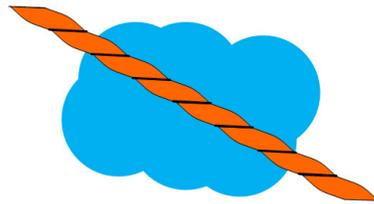
♦ Pour a small puddle of water on the cable while it rests on the floor.

♦ Dunk the cable in a cup of water.

♦ Soak a paper towel or rag and wrap it loosely around the cable. This is popular if the cable is used in pipe applications. Be careful to wrap the wet cloth loosely around the cable. Do not put pressure on the cable.

IMPORTANT - To avoid inaccurate readings, do not grip the cable with your hand.

Figure 2.8 Apply Moisture to the Cable for Testing Purposes

2 Verify that the LD2100 reports the leaks within a few feet of their actual physical location.

3 Remove the simulated leak source and return the system to its normal operating state.

3

WEB INTERFACE

Use the LD2100's web interface to configure and monitor the status of the system.

To access the LD2100's web interface, type the device's IP address into your web browser's location bar. Once you navigate to the IP address, a login prompt asks for a username and password. Enter the appropriate information, which is either the default user name (no password), or a user name and password assigned by your system administrator.

3.1. Home Page

The home page features vital system information, including current alarm status, the reported length of sensing cable connected to the system, the last time the system went into alarm, and the running system uptime. The image to the right of the table can be customized, and can be linked to interactive floor maps.

Figure 3.1 LD2100 Web Interface Home Page

Field	Description
Alarm Status	If the controller is in an alarm state, details regarding the alarm are noted in this field. The field is color coded to indicate the type of alarm.
Cable Length	The length of cable connected to the controller, as calculated by the LD2100.
Cable Current	The amount of current running on the sensing cable.
Leg 1 Resistance	The resistance of Leg 1 is displayed in Ohms.
Leg 2 Resistance	The resistance of Leg 2 is displayed in Ohms.
Leak Alarm Delay Count	The amount of time (in seconds) that passes between the time a leak is detected and when it is annunciated.
Contamination Alarm Delay Count	The amount of time (in seconds) that passes between the time a contamination alarm is detected and when it is annunciated.
Re-alarm Countdown	The amount of time remaining before an alarm is re-annunciated.
Last Alarm Time	The last time an alarm was detected
sysUp Time	The amount of time that has passed since the system was last reset or powered on.

Table 3.1   LD2100 Home Page

3.2   Identity

The Identity link displays basic LD2100 information, including model number, system name, contact information, firmware version, and IP address. Most of these values can be adjusted through the Configuration screens. This page is intended for reference only, not system adjustment.

Figure 3.2   Identity Page

3.3 Configuration

The Configuration link provides access to a series of sub-menus from which users can adjust system settings.
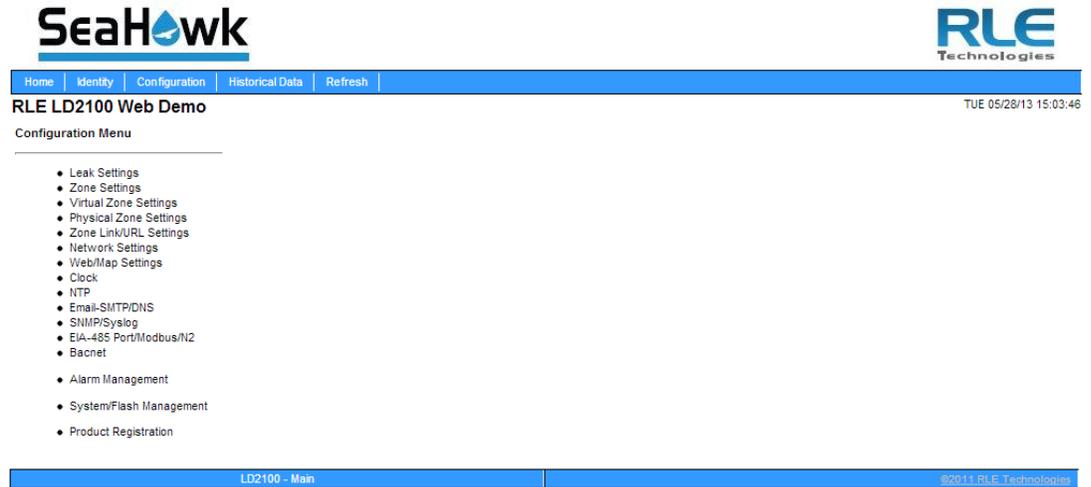
Figure 3.3 Configuration Page

NOTE **If any of the fields within the sub-menus are edited, be sure to click the Submit Changes button to save the changes. If you edit the fields and navigate from the web page without clicking the Submit Changes button, all changes will be lost.**

3.3.1 Leak Settings

Use the Leak Configuration page to fine tune system variables, including leak and contamination thresholds, latching and unlatching alarms, and sensing cable resistance.

Figure 3.4   Leak Settings Configuration

Option	Description
Leak Trip Point	The threshold for the amount of water required to trigger a leak alarm. Adjust this number to adjust the sensitivity of the leak alarm. A lower number yields a more sensitive system, so the system will trigger a leak alarm with less water present. A higher number produces a less sensitive system, so more water is required to trigger an alarm. Enter a value between 25 and 295 microamps. Default setting: 150uA
Contamination Trip Point	The threshold for the amount of contamination required to trigger a cable contamination alarm. Adjust this number to adjust the sensitivity of the contamination alarm. A lower number yields a more sensitive system, so the system will trigger a contamination alarm with less contamination present. A higher number produces a less sensitive system, so more contamination is required to trigger an alarm. Enter a value between 20 and 295 microamps. Default setting: 50uA

Table 3.2   Leak Configuration Options

Option	Description
Leak Alarm Delay	The amount of time that passes between the time a leak is detected and the annunciation of the leak alarm. The leak trip point must be exceeded for the duration of this delay. Default setting: 20 seconds
Contamination Alarm Delay	The amount of time that passes between the time a contamination is detected and the annunciation of the contamination alarm. The contamination trip point must be exceeded for the duration of this delay. Default setting: 40 seconds
Resistance Per Foot	The resistance per foot (or meter) of cable determines the LD2100's ability to accurately detect the cable length installed and calculate distances to leaks. Adjust this value to fine-tune the accuracy of a distance-read leak detection system. RLE's sensing cables have a base resistance of 2.800 ohms per foot. The resistance value must be entered as a 4-digit number between 2.000 and 4.250, with one number in the tens place and three numbers past the decimal point (x.xxx). Default setting: 2.800 ohms per foot
Re-Alarm Interval	The LD2100 can be set to re-alarm - after a leak or contamination has been detected, the alarm will be re-sent at a defined interval until the alarm condition has been resolved. The re-alarm triggers both the audible alarm and the direct notification alarm. Enter a number from 0 to 24. A 0 in this field turns off the re-alarm option, so only one alarm notification will be sent for each alarm. Default setting: 0 (disabled)
Measurement Display	Select either feet or meters to calibrate the LD2100 to the preferred unit of measure. All distance calculations will adjust accordingly. Default setting: Feet

Table 3.2 Leak Configuration Options

Option	Description
Latching Alarms	A non-latching alarm resets itself once a detected leak or contamination has been resolved. A latching alarm must be manually acknowledged before its annunciation clears, even if the detected leak or cable problem is no longer present. Select Yes (latching) or No (non-latching). Default setting: No (non-latching alarms)
Audible Alarm	Select Enabled to activate the audible alarm annunciation. Disable this option to deactivate the audible alarm annunciation. Default setting: Disabled
Length Calibration Factor	Reserved for manufacturer's use only.

Table 3.2   Leak Configuration Options

Set Cable Relay Button - Used to troubleshoot the controller, this button simulates 8060 ohms of leak detection cable (approximately 2878 feet of 2.8 ohms/foot cable) for up to 5 minutes. Push the button and then look at the web interface home page. If the controller is functioning properly, the cable length will register approximately 2878 feet, and the leg 1 and leg 2 resistance will be approximately 8060 ohms.

3.3.2 Zone Settings

You can set up the LD2100 to identify different areas where leak detection cable or spot detectors are installed. Each area is called a *zone.* Up to 32 zones can be configured on the LD2100 - the LD2100 itself is the master controller, and up to 31 slave units can connect to it.

Dividing a leak detection system into zones helps locate leaks quickly. It can also simplify troubleshooting by allowing you to isolate different sections of cable and different rooms or other defined areas. The LD2100 uses two different types of zones:

- ♦ **Physical zone**. A physical zone consists of a single SeaHawk distance read controller, including the LD2100 and other RLE distance read controllers attached to it, and the attached sensing cable. In a scenario where additional controllers are attached, the LD2100 acts as a Modbus master to other controllers. To configure *physical* zones, including setting up the LD2100 as a Modbus master attaching additional controllers, follow the instructions in Chapter 4.

- ♦ **Virtual zone**. A virtual zone is a labeled reference point in a leak detection system. A virtual zone can consist of a room, a drip pan containing a spot detector under an air handler unit, a combination of rooms and components, or any other defined area whose identification would help in the location of leaks.

If you wish to establish virtual zones, go to Configuration>Zone Settings. The Zone Configuration page displays. Select the desired zone settings.

Figure 3.5   Zone Configuration

Option	Description
Zones 0 - 32	Enter an integer from 0 to 32 to indicate the number of virtual zones you want to configure.
Modbus Zone Traps	Select the Enable radio button to enable SNMP traps for the Leak Detection Modbus master. Default: Disable.
Enable Alarm Relay for Modbus Slaves	Select the Enable radio button to activate the summary alarm when a leak detection slave unit goes into an alarm. Default: Disable

Table 3.3   Zone Settings Configuration Options

3.3.3 Virtual Zone Settings

Once you've designated how many virtual zones you'd like to have, you need to provide the necessary information to define where the virtual zones are in your installation. Do this on the Virtual Zone Settings page.

	Virtual Zone Configuration	
Submit Changes		
Zone #	Label	End Distance
1	ZONE #1 - North East Wall	25
2	ZONE #2 - South East Wall	50
3	ZONE #3 - South Wall (AHU-5)	75
4	ZONE #4 - South Wall (AHU-4)	100
5	ZONE #5 - SouthWest Wall	125
6	ZONE #6 - West Wall (PD-4)	150
7	ZONE #7 - West Wall (AHU-3)	175
8	ZONE #8 - West Wall (PDU-3)	200
9	ZONE #9 - North Wall (AHU-2)	225
10	ZONE #10 - North Wall (AHU-1)	275
11	ZONE #11 - Aisle M (AHU-12, AHU-13)	325

Figure 3.6   Virtual Zone Settings Configuration Page

Option	Description
Zone #	A fixed number, 1 - 32, used to designate the Zone.
Label	Type a descriptive label for the zone, 30 characters or less.
End Distance	Record the sensing cable's distance measurement at the END of the zone. Zone 1 starts at 0 feet / meters, and you designate the end point for Zone 1. Zone 2 starts at zone 1's ending distance; you designate where Zone 2 ends. Each subsequent zone begins where the previous zone ends.

Table 3.4   Virtual Zone Configuration Options

3.3.4 Physical Zone Settings

Physical zones represent actual pieces of hardware that are connected to the LD2100. You'll use the Physical Zone Settings page to designate specific information about these physical zones, but first you'll need to designate the LD2100 as a Modbus Master and connect slave devices to the LD2100. For complete physical zone configuration information, refer to Chapter 4.

3.3.5 Zone Link/URL Settings

If you've connected slave devices to the LD2100, you may want access to additional information for each of these units.

To fill this need, users can designate up to 32 links to appear on the LD2100's home page. Links will appear on the lower left side of the screen, below the tables of information, and each link can connect to a specific URL. Use this page to configure all the links you'd like to see on the home page.
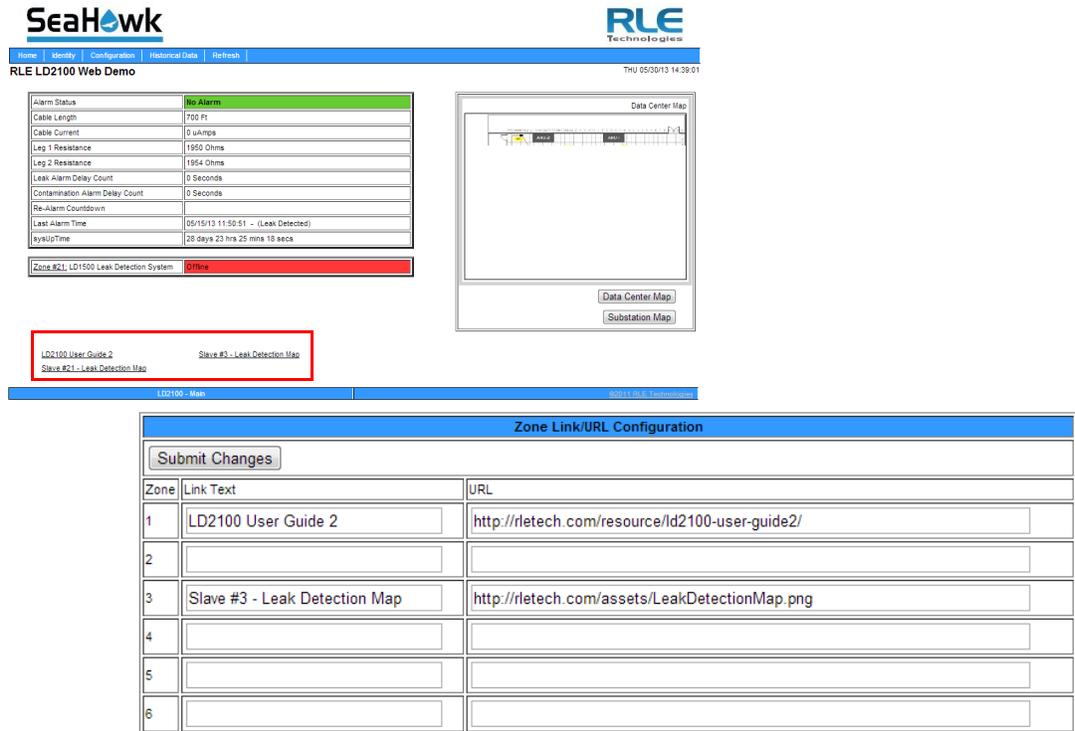
Figure 3.7 Zone Link/URL Settings Configuration Page

Option	Description
Zone	A fixed number, it designates the zone associated with the link.
Link Text	Users can designate links to appear on the LD2100's home page. Links will appear on the lower left side of the screen, below the tables of information. Additional links can be configured through the Zone Link/URL Settings configuration link. Enter the text for the first link here.
URL	This is the URL that the link on the home page will connect to. Enter the appropriate URL here.

Table 3.5 Zone Link/URL Settings

3.3.6 Network Settings

The Network/IP page displays the assigned MAC address and allows users to configure common network information. Editing this information will change the way the web interface operates. Only change this information if you have been in contact with your network administrator, and are sure the changes are correct.

IP Configuration

Submit Changes
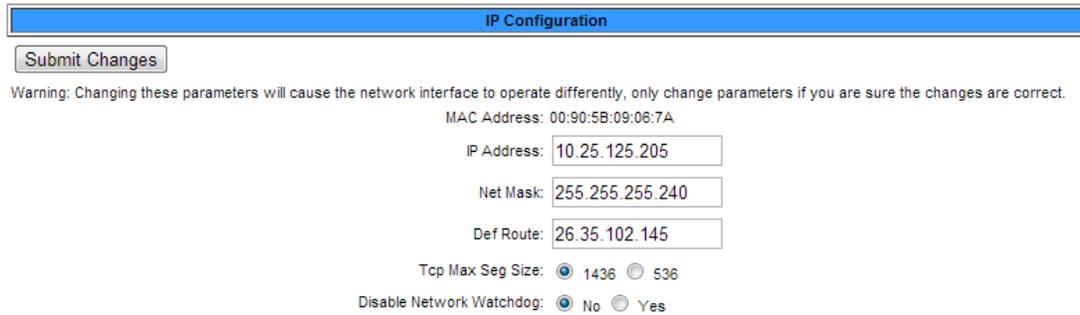
Warning: Changing these parameters will cause the network interface to operate differently, only change parameters if you are sure the changes are correct.

MAC Address: 00:90:5B:09:06:7A

IP Address: 10.25.125.205

Net Mask: 255.255.255.240

Def Route: 26.35.102.145

Tcp Max Seg Size: ● 1436 ○ 536

Disable Network Watchdog: ● No ○ Yes

Figure 3.8 Network/IP Configuration Page

Option	Description
MAC Address	The MAC address is a unique identifier set by the manufacturer, and is non-editable.
IP Address	Set the IP address for the LD2100, so it can communicate on your network. If you do not have an IP address for the device, obtain one from your IT department. Default IP address: 10.0.0.188
Net Mask	Designate the device's Subnet Mask. Contact your IT department for further information. Default subnet mask: 255.255.255.0
Def Route	Designate the device's default route (default gateway). If you do not have a default route, obtain one from your IT department. Default device route: 10.0.0.1
Http Port	Some ISPs use alternate http ports as an added security measure. Edit this field in accordance with your ISPs security settings. Default: 0 = Port 80
Tcp Max Seg Size	The LD2100 defaults to 1436 packet size for web page data. Users may select 536 for limited bandwidth or VPN applications. Default: 1436
Disable Network Watchdog	The network watchdog is used to reboot the device if excessive network traffic or errors are detected. Default: No

Table 3.6 Network/IP Configuration Options

3.3.7 Web/Map Settings

Use this page to establish passwords and a username for the web interface, to customize the web interface's home page with your own graphics and links, and to create an interactive leak detection map.

Figure 3.9   Web/Map Configuration Page

Option	Description
Web Username	Designate a username used to access the web interface. Default username: ld2100
Web Password Read Only	Two separate passwords can be configured on the LD2100. The Read Only password allows users to access the LD2100's web interface and view the conditions of the system, but does not allow users to make changes to the LD2100's configuration. Default password: field is left blank (no password required)
Web Password Read/Write	The second configurable password on the LD2100 provides users with expanded access. The Read/Write password allows users to view the conditions of the system and make changes to the LD2100's configuration. Default password: field is left blank (no password required)

Table 3.7   Web/Map Configuration Options

Option	Description
Web Refresh Rate	Decide how often the web page refreshes - checks for new data and reloads the web page - when left in an open web browser. Enter a value from 10 to 999 seconds. If you enter 0, the screen will not refresh on its own - you'll have to click the refresh button on your web browser or press F5 to refresh the screen. Default setting: 10 seconds
Main Page Image	One image appears on the right side of the home page. Images are uploaded through the Map page of the web interface. Select an image from the drop down list of uploaded images. Default setting: Seahawk
Main Page/Zone 1 Link Text	Users can designate links to appear on the LD2100's home page. Links will appear on the lower left side of the screen, below the tables of information. Additional links can be configured through the Zone Link/URL Settings configuration link. Enter the text for the first link here.
Main Page/Zone 1 Link URL	This is the URL that the link on the home page will connect to. Enter the appropriate URL here.
Floor Map #1 Link Text	Links to two floor maps can be displayed on the LD2100's home page. These links display under the image on the right side of the screen. The maps themselves are loaded on the Configuration>System/Flash Management Screen. Enter the text for the link to the first map here.
Floor Map #2 Link Text	Enter the text for the link to the second map here.
Floor Map #1 Interactive	While the LD2100 can display two maps, only one of the maps can be interactive. If you'd like Map #1 to be interactive, designate that here.

Table 3.7   Web/Map Configuration Options

3.3.7.1   Working with a Reference Map

The LD2100 allows users to upload up to 2 maps of their facilities - one of which can be populated with interactive leak detection data. This provides users with a real-time view of their facility, including the physical location and status of their leak detection equipment, and a visual indication of any active alarms.

Through the mapping process, the LD2100 creates an overlay for an uploaded map image. It superimposes the locations of your equipment - based on coordinates you designate - over the top of your map image. This overlay is created through the links at the bottom of the Web/Map Settings page. Once uploaded and populated, the map is accessible through the buttons generated on the right side of the LD2100 home page.

Do not attempt to map your facility until your monitoring area is completely assembled - all of your leak detection equipment is in place, tested, and functional.

You can draw a map yourself, or RLE can create the map from a sketch or mechanical drawing that you provide. When creating your own map and image file, keep in mind that the image file must be:

◆ 500kb or less in size.

◆ 4000 x 4000 pixels or less.

◆ A .png, .jpg, or .gif formatted file.

Load A Map

Before you can create the interactive overlay, you need to upload the map image file.

1 In the user interface, go to Configuration>System/Flash Management.

The System Management web page displays.
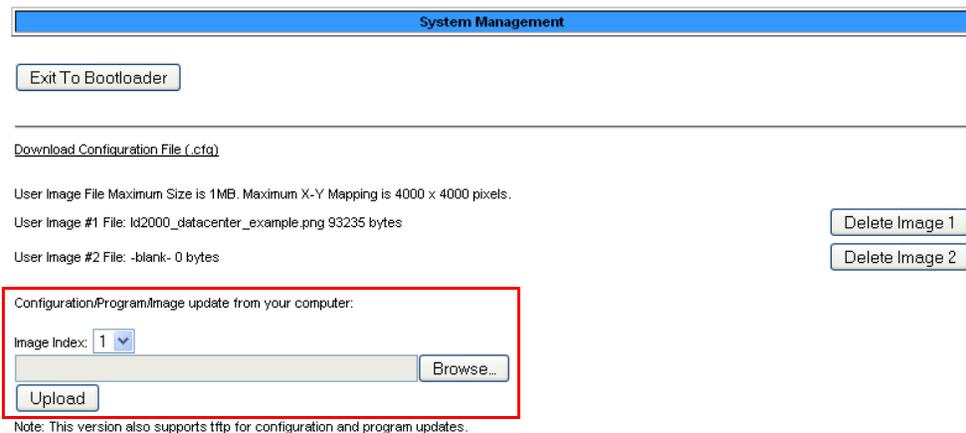
Figure 3.10 Load a Map

2 If you want the map to be interactive so you can set reference points for ease of leak location, use the Image Index pull-down to select to upload an image to index 1.

If you want to upload a map that you will use for reference, select index 2.

Note If you upload another image to one of the two index locations where an image is already present, the image currently in that location is overwritten.

3 Click the Choose File button to locate the file on the computer's hard disk or on a network drive.

4 Click the Upload button.

5 If desired, repeat these instructions to upload a second image file to the other index location.

Return to the Web/Map Settings Configuration page. In the Floor Map #1 Link Text field, type a title for the map. Do the same for the second image, if you have loaded one.

Delete an Image

If you uploaded a map or other image that you decide not to use, and you aren't planning on replacing it with another image, delete the image by going to Configuration>System/Flash Management and click the button for the index location that contains the image (Image index 1 or 2).
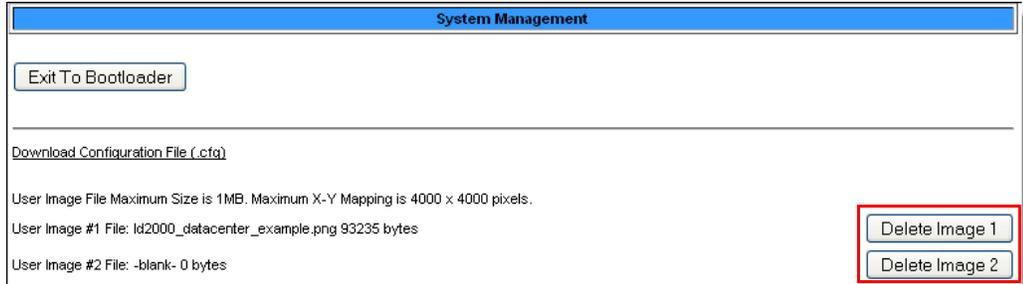
Figure 3.11 Delete an Image

Mark Reference Points on the Map

Now that you have uploaded the map, it's time to mark reference points on the map that you can refer to if a leak occurs. These reference points are the overlay mentioned earlier - the LD2100 places this data over the top of your image, to pinpoint alarms in real-time.

Since the LD2100 never actually edits your map, if you should need to update your map image, previously designated map points will not need to be reconfigured. As long as you do not change size of your map, previously mapped coordinates should not need to be adjusted when you upload a new version of your map.

To mark reference points:

1 In the user interface, go to Configuration>Web/Map Settings.

The Web Configuration page displays.
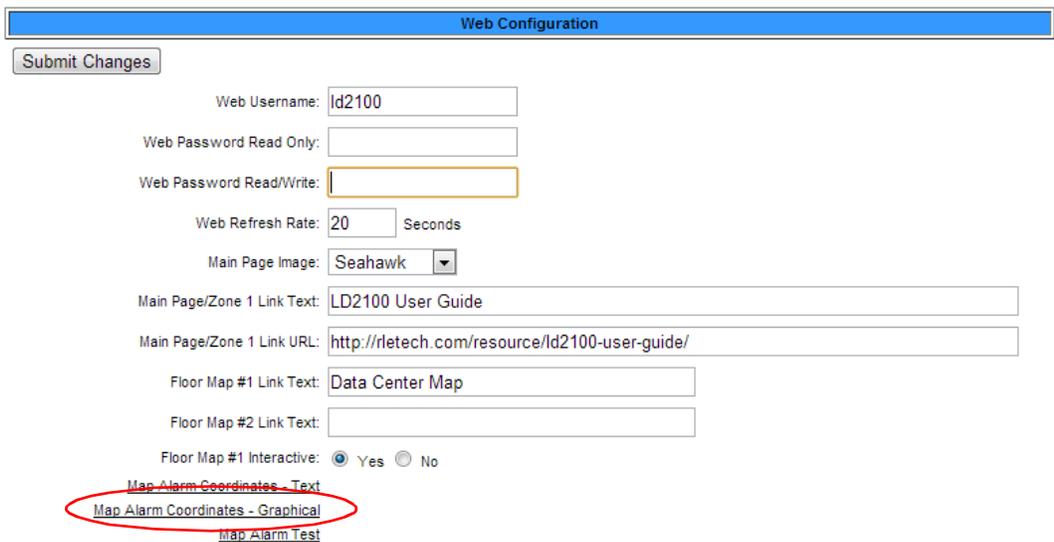
Figure 3.12 Web Configuration Page—Map Alarm Coordinates (Graphical) Link

2 Select the Yes radio button for Floor Map #1 Interactive.

3 Click the Map Alarm Coordinates - Graphical link near the bottom of the web page.

An enlarged view of the map displays.

4 In the "Enter a distance" box at the top of the web page, type 0 to set the reference point for the beginning of the cable.

Get the X-Y coordinates of the image on click   Current map coordinate count: 8

Enter a distance 0   then click on the image

5 Click on the map to designate the location of the 0 point of the cable. The cursor displays as cross hairs.
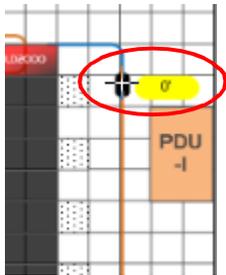
Clicking on a map's reference point

When you click on the map, the distance and the x-y coordinates of the location are stored in the LD2100's memory.

6 Enter the next distance to be recorded and click on the map in the corresponding location. Repeat this step for each reference point you want to add to the map.

Note   It is recommended that you enter the cable distance each time the cable changes direction.

7 If any coordinates need to be adjusted, you can fine tune them through the Map Alarm Coordinates - Text link on the Map Configuration page. Click this link to display all the mapped coordinates and the distance readings associated with them.

Map Alarm Coordinates

Page 1 of 20   Jump to page: --

Submit Changes

Index	Distance	X-Coordinate	Y-Coordinate
1	0	905	191
2	50	897	707
3	58	862	642
4	125	220	638
5	135	197	571
6	148	237	483
7	150	204	478
8	157	260	444
9	164	258	319

Figure 3.13 Map Coordinates—Text View

When a leak occurs, its location will be shown on the map.
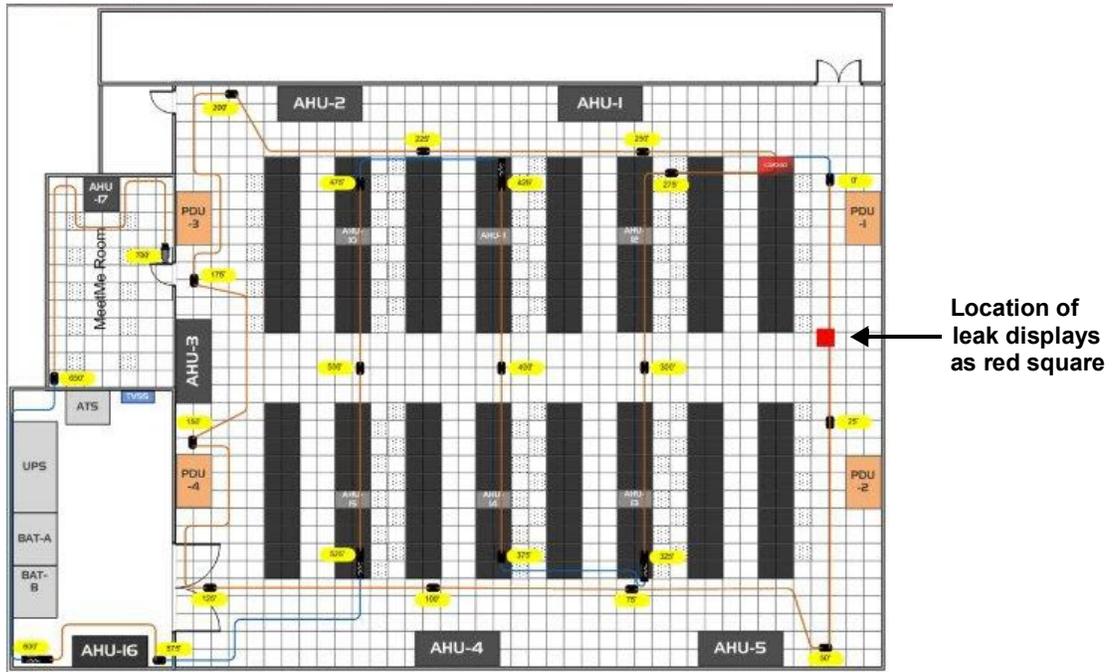
Figure 3.14 Map with Location of Leak Shown

View an Enlargement of the Map

Maps are available from the home page and can be viewed at any time. Once you have given the map a title, the title appears on the Home page as an active button below the map image. If you have uploaded and titled two images, two buttons appear below the main map (the map loaded into Image index 1). To view an enlargement of an image, click the button for the image you want to enlarge. The enlarged image displays in a new browser window.

Figure 3.15 Map (Image) Buttons on Home Page

3.3.8 Clock

Use this link to adjust the date and time as needed. Click the **Submit Changes** button to save all modifications.

Figure 3.16 Clock Configuration Page

Option	Description
Date	Adjust the current date, in mm/dd/yy format.
Time	Adjust the current time in hh:mm:ss format.
Day	A non-configurable field, the day of the week is generated based on the date.

Table 3.8   Clock Configuration Options

3.3.9 NTP (Network Time Protocol)

NTP, or Network Time Protocol, is used to synchronize clocks of computer systems. NTP synchronizes the time of a computer or device (the LD2100) with another computer or referenced time source. NTP maintains a high level or accuracy and reliability in time stamped events.

Figure 3.17 NTP Configuration Page

Option	Description
NTP Server	The IP address or hostname of the NTP server with which your LD2100 will synchronize. Public NTP servers include us.pool.ntp.org and time.nist.gov Default setting: blank
Update Interval	Designate how often you'd like the LD2100 to access and synchronize with the NTP server. Enter a 0 to disable this feature. Default setting: 0 (disabled)
Select Time Zone	Select the time zone in which this particular LD2100 resides. Default setting: Western European (UTC + 0)
Daylight Savings Time	Enable or disable Daylight Savings Time, and designate at which time DST goes into effect in your time zone. Default setting: Disabled
DST Begin Date	Set the day DST begins at your location. Default setting: Second Sunday - March
DST End Date	Set the day DST ends at your location. Default setting: First Sunday - November

Table 3.9 NTP Configuration Options

3.3.10 Email-SMTP/DNS

Configure email and SMTP setting through this page.

Figure 3.18 E-mail Configuration Page

Option	Description
Access Type	Select LAN to send alerts through a local network connection. Select None to disable the email feature. Default setting: LAN
Options - **Email Contamination Alarms**	The LD2100 will send alerts for leak and cable break alarms. Decide if you'd also like to receive email alerts for contamination alarms. If so, check this box. If false alarms are often detected on your system, you may want to disable this function Default setting: checked (contamination alarms enabled)
Primary DNS Server	Enter the IP address for the primary DNS server, as provided by your internet service provider. Default setting: 0.0.0.0

Table 3.10 Email Configuration Settings

Option	Description
Secondary DNS Server	Enter the IP address for the secondary DNS server, as provided by your internet service provider. Default setting: 0.0.0.0
Mail (SMTP) Server	Enter the URL of the mail server you will be using.
Mail Sender Address	This is email sender address assigned to the LD2100.
Mail Subject	Text that appears in the subject line of the email message.
Mail Recipient (1)	The email address of the first recipient.
Mail Recipient (2)	The email address of the second recipient.
Mail Recipient (3)	The email address of the third recipient.
Mail Recipient (4)	The email address of the fourth recipient.
Smtp Authentication	Used for ESMTP. Use the default setting, unless otherwise directed by your IT department. Default setting: None
Smtp Username	Used for ESMTP. Use the default setting, unless otherwise directed by your IT department. Default setting: Blank
Smtp Password	Used for ESMTP. Use the default setting, unless otherwise directed by your IT department. Default setting: Blank
View Smtp Log / Send Test Email	View a log of all email messages that have been sent by the LD5200. This link provides access to a button that generates and sends a test email.

Table 3.10 Email Configuration Settings

3.3.11 SNMP/Syslog

You can configure the LD2100 for SNMP communications, including setting SNMP traps.

Figure 3.19 SNMP/Syslog Configuration

Option	Description
MIB-2 System Options	
System Name	Appears on the LD2100 Main Menu and is included as part of email notifications. Designate a name, up to 30 characters.
System Contact	Lists the individual responsible for the LD2100. The System Contact is only available through SNMP Gets and is not included in email or SNMP Trap notifications. Enter up to 30 characters per line.
System Location	Enter the physical location of the LD2100. The System Location is not included in email or SNMP Trap notifications.
V1/V2C Community Names	
Get/Read	Enter the appropriate community name.
Set/Write	Enter the appropriate community name.

Table 3.11 SNMP/Syslog Menu Options

Option	Description
Trap	Enter the appropriate community name.
Traps Options	
Select SNMP Trap Type	Select the appropriate trap type from the following options: V1-Trap, V2C-Trap, V2C-Inform, V3-Trap, V3-Inform
Max Inform Retries	The number of times the LD2100 will attempt to resend an undelivered trap. Enter a number 0 - 999. Enter 0 for an unlimited number of attempts. Default = 0 (unlimited)
Inform Interval	The number of minutes that passes between inform operations. Enter a number of minutes, 1 - 999. Default = 1
Trap Destinations	
IP Address	The IP address of the server to send the trap information to.
TrapEnable	Check this box to indicate that trap information should be sent to the specified server.
Syslog Message	Check this box to indicate that syslog messages should be sent to the specified server.
SnmpV3	
Engine ID	An uneditable field that lists the engine ID.
Context Name	Enter the alphanumeric name used for the SNMP v3 interface.
#	An uneditable field used to designate individual users.
User Name	Enter a unique name for each user.
Access Mode	Choose from the following: No Authentication Authentication - MD5 Privacy Authentication - MD5 A user name is need for No Authentication, and a user name and password are required for Authentication and Privacy Authentication access.
Auth-Password	Enter the authentication password - the password must be between 8 and 24 characters long.
Priv-Password	Enter the privacy (encryption) password - the password must be between 8 and 24 characters long.
Send Test Trap - Leak Detected **Send Test Trap - Cable Break** **Send Test Trap - Contamination**	Use these buttons to send test traps - test your system setup to ensure all information has been entered correctly.

Table 3.11 SNMP/Syslog Menu Options (continued)

3.3.12 EIA-485 Port/Modbus/N2

Note If you want to configure the LD2100 as a Modbus Master, follow the instructions in Chapter 4.

If the LD2100 will communicate via the EIA-485 port, configure the necessary options here. The screens for Modbus-Slave, Bacnet-MS/TP Slave, Modbus-Master, and N2 are the same. The LCD-240 screen has a few additional options. To access the screen for your application, select you choice (Modbus-Slave, Bacnet-MS/TP Slave, Modbus-Master, LCD-240, or N2) from the drop down menu and click the **Submit Changes** button. The appropriate options for your selection will display. Fill in the blanks and click the **Submit Changes** button again to save your changes.

Figure 3.20 Modbus-Slave, Bacnet-MS/TP Slave, Modbus-Master, N2 Configuration

Option	Description
Modbus/TCP/UDP Slave Unit Identifier	This designator is used for Modbus RTU over an Ethernet connection. Set the slave unit identifier, 1-254. 0 = disabled.
EIA-485 Port Function	Select the function of the EIA-485 port: Modbus-Slave, Bacnet/MS-TP Slave, Modbus-Master, LCD-240, or N2. Click the **Submit Changes** button to enact the change and display the options available for that particular port function. Default: Modbus-Slave
EIA-485 Baud Rate	Selectable: 9600, 19200, 38400, or 57600
EIA-485 Parity	Select None, Even, or Odd
EIA-485 Slave Address	Set the slave address, 1-254. 0 = disabled

Table 3.12 EIA-485 Port/Modbus Options

Option	Description
LCD Options	A small number of companies connect an aftermarket LCD to the LD2100. This option allows them to configure the text messages that are pushed to that screen. Two lines of text are available on this particular screen, containing a maximum of 40 characters each.
	After selecting the LCD-240 display option, click the submit changes button. When the page refreshes there will be eight fields to configure.
LCD240 Identifier	Enter the name of the LD2100 system.
LCD240 Normal Text	The text that displays on the LCD when the system is in a normal state.
LCD240 Alarm Text	The text that displays on the LCD when the system is in an alarm state.
LCD240 Leak Text	The text that displays on the LCD when the system detects a leak.
LCD240 Cable Break Text	The text that displays on the LCD when the system has a cable break.
LCD240 Contamination Text	The text that displays on the LCD when the system detects a contamination alarm.
LCD240 Refresh Interval and Refresh on Alarms Only Checkbox	The time interval that passes between screen refreshes.
	If you check the Refresh on Alarms only checkbox, the display refreshes only when an alarm is triggered.
Modbus Slave Register Display Log/Statistics	Click these links to display the corresponding data.
Modbus Packet Log	
N2 Register Display Log / Statistics	

Table 3.12 EIA-485 Port/Modbus Options

Figure 3.21 LCD-240 Configuration

3.3.13 Bacnet

The LD2100 can be configured as a BACnet slave if you would like to tie it into an existing BMS. BACnet allows building automation and control devices to communicate, regardless of the services they perform.

Figure 3.22 Bacnet Page

Option	Description
BACnet Device Name	Designate a unique name for the LD2100, up to 30 characters
BACnet Device ID	Set the device ID, up to 30 characters. 0 = disabled
BACnet Description	Enter a description for the device, up to 30 characters
Bacnet UDP Port	Enter a 0 to specify port 47808 (0xBAC0) as the UDP port. If another port is specified by your application, enter that value here. Default setting: 0
Bacnet MS/TP Max Master	Set the slave address, 1-127. 0 = Slave only Default setting: 0
Register as Foreign Device at IP	IP address of the master device with which you're trying to communicate. Requires a BBMD for foreign device discovery.
Registration Time-to-Live	Time, in seconds, for foreign device discovery.
Foreign Device Table #1 & #2	Fixed fields whose content is drawn from the entries in the Register Foreign Device and Registration T-t-L fields.
Bacnet BBMD-BDT	Used by some BACnet masters for discovery on different subnets.
LD5200 IP Address	Non-editable, this address is configured through the Network/IP link.
(Primary) #1 IP Address	Designate the appropriate IP addresses.
#2 IP Address	
#3 IP Address	
#4 IP Address	
Bacnet Alarms Event Notification	
Recipient #1 IP Address	When there is a BACnet alarm, a message will be sent to this address.
PID	If necessary, enter the process identifier.
Notification Type	Select unconfirmed or confirmed. If you select confirmed, the recipient will be required to acknowledge the alarm. Default setting: Unconfirmed
Notification Class	A list of devices to be informed if an event enrollment object determines that a warning or alarm message needs to be sent.
Priority	Designate a priority to controls where conflicting control situations may occur.
Leak Detected Alarms	Select analog or binary.
APDU_Timeout	Amount of time (milliseconds) between retransmissions of an APDU requiring acknowledgement for which no acknowledgement has been received.

Table 3.13 Bacnet Options

Option	Description
Number_of_APDU_ Retries	The maximum number of times and APDU is retransmitted.
Send Test Alarms	Click this button to test your alarm configuration. Press the submit changes button before clicking this link, or all your BACnet configuration data will be lost.
Clear Test Alarms	Click this button to clear the test alarms once they have been sent and correctly received.

Table 3.13 Bacnet Options

3.3.14 Alarm Management

Use this page to manage and reset current alarms, messages, and alarm history.

Figure 3.23 Alarm Management Page

Option	Description
Reset Leak Alarm	Resets the current leak alarm and causes the LD2100 to recheck the current cable conditions. This clears the alarm condition if the cable registers that the leak threshold is within an accepted range.
Clear Alarm History	View the alarm history through the Historical Data link at the top of the web interface. Click this button to clear the alarm history of all previous alarms.
Acknowledge Unsent Emails	Clears unsent emails so they aren't sent to recipients. Events are still logged in the historical data.
Acknowledge Snmp Informs	Acknowledges SNMP Informs and stops Informs from being sent out for the current alarm condition.
Enable Power Up Alarm Logging	Check this box and click the Submit button to log an alarm when the LD2100 powers up. This way, if the power cycles on the unit, you will be able to look in the alarm history log and see a record of the activity.

Table 3.14 Alarm Management Options

3.3.15 System/Flash Management

Use this page to update the LD2100's firmware, to upload maps, and to backup the LD2100's configuration file. Refer to Appendix A, "Update Firmware" on page 87 for complete firmware update instructions.

Figure 3.24 System/Flash Management Page

Option	Description
Exit to Bootloader	Access the bootloader.
Download Configuration File (.cfg)	Save a copy of the LD5200's configuration file to a local computer. Always save a copy of the .cfg file before you update the firmware on the LD5200.
Upload and Manage Image Files Two map images can be uploaded to the LD2100. Each file must be less than 1MB, and 4000 x 4000 pixels, max.	
Delete Image 1 Button	Click this button to delete the image loaded into the LD2100 as User Image #1.
Delete Image 2 Button	Click this button to delete the image loaded into the LD2100 as User Image #2.
Upload a New Image	Two images can be uploaded to the LD2100. Use the numerical drop down to designate whether you're uploading the image as image 1 or image 2. Click the Choose File button to navigate to a file on your computer that you'd like to upload. Click the Upload button to execute the upload.

Table 3.15 System/Flash Management Options

3.3.16 Product Registration

The Product Registration link routes users to the product registration form at rletech.com. Complete this form to receive product and firmware updates and support.

3.4. Historical Data

The Historical Data link provides access to logged historical data, including alarm and trending data. The LD2100's historical data includes a time-stamped chronology of events and a trend log that contains occurrences of current leakage

```
Page 1  Page 2                                            AlarmHistory.txt  AlarmHistory2.txt  Trend Log


Alarm History Entries: 210 (Page 1/1)

AH210-02-ALM -05/30/13 06:27:39 Loss of Communications - LD1500 Leak Detection System
AH209-02-RTN -05/28/13 15:49:15 Loss of Communications - LD1500 Leak Detection System
AH208-04-RTN -05/15/13 11:53:01 No Leak - ZONE #1 - North East Wall
AH207-04-ALM -05/15/13 11:50:51 Leak Detected at 102 Feet - ZONE #5 - SouthWest Wall
AH206-04-RTN -05/13/13 15:45:57 No Leak - ZONE #1 - North East Wall
AH205-04-ALM -05/13/13 15:43:47 Leak Detected at 102 Feet - ZONE #5 - SouthWest Wall
AH204-04-RTN -05/08/13 15:19:56 No Leak - ZONE #1 - North East Wall
AH203-04-ALM -05/08/13 15:17:47 Leak Detected at 102 Feet - ZONE #5 - SouthWest Wall
AH202-04-RTN -05/03/13 10:45:16 No Leak - ZONE #1 - North East Wall
AH201-04-ALM -05/03/13 10:43:07 Leak Detected at 102 Feet - ZONE #5 - SouthWest Wall
AH200-02-ALM -05/01/13 14:04:56 Loss of Communications - LD1500 Leak Detection System
AH199-06-RTN -05/01/13 14:04:22 CPU Reset - power up
AH198-04-RTN -05/01/13 01:54:52 No Leak - ZONE #1 - North East Wall
AH197-04-ALM -05/01/13 01:53:48 Leak Detected at 272 Feet - ZONE #10 - North Wall (AHU-1)
AH196-04-RTN -04/30/13 17:00:44 No Leak - ZONE #1 - North East Wall
AH195-04-ALM -04/30/13 16:58:36 Leak Detected at 272 Feet - ZONE #10 - North Wall (AHU-1)
AH194-04-RTN -04/10/13 13:48:58 No Leak - ZONE #1 - North East Wall
AH193-04-ALM -04/10/13 13:46:50 Leak Detected at 102 Feet - ZONE #5 - SouthWest Wall
AH192-04-RTN -04/10/13 13:08:56 No Leak - ZONE #1 - North East Wall
AH191-04-ALM -04/10/13 13:06:46 Leak Detected at 102 Feet - ZONE #5 - SouthWest Wall
AH190-04-RTN -04/03/13 10:33:36 No Leak - ZONE #1 - North East Wall
AH189-04-ALM -04/03/13 10:31:24 Leak Detected at 102 Feet - ZONE #5 - SouthWest Wall
AH188-04-RTN -03/28/13 05:10:14 No Leak - ZONE #1 - North East Wall
AH187-04-ALM -03/28/13 05:08:37 Leak Detected at 272 Feet - ZONE #10 - North Wall (AHU-1)
AH186-04-RTN -03/27/13 13:09:00 No Leak - ZONE #1 - North East Wall
```

Figure 3.25 Historical Data

Each entry in the alarm history is recorded in the format $AHxxxyy\ MM/DD/YY\ HH:MM:SS$. See the following table for a description of this format.

Item	Description
AH	Stands for "alarm history"
xxx	The log entry number for the alarm/event.
yy	The event code, which indicates the type of event, as follows: 03 – Cable Fault 04 – Leak Detected 05 – Contamination Detected 06 – Reset/Power Up
date and time	Displayed as MM/DD/YY and HH:MM:SS (24 hour format).
text	Provides details about the current alarm/event.

Table 3.16 Alarm History Log Description

Alarm history data is also available as a text file (.txt.). Click the AlarmHistory.txt or AlarmHistroy2.txt link to download the data as a text file.

```
LD2100 Alarm History
RLE LD2100 Web Demo
Alarm History Entries: 210 (Page 1/1)

AH210-02-ALM -05/30/13 06:27:39 Loss of Communications - LD1500 Leak Detection System
AH209-02-RTN -05/28/13 15:49:15 Loss of Communications - LD1500 Leak Detection System
AH208-04-RTN -05/15/13 11:53:01 No Leak - ZONE #1 - North East Wall
AH207-04-ALM -05/15/13 11:50:51 Leak Detected at 102 Feet - ZONE #5 - SouthWest Wall
AH206-04-RTN -05/13/13 15:45:57 No Leak - ZONE #1 - North East Wall
AH205-04-ALM -05/13/13 15:43:47 Leak Detected at 102 Feet - ZONE #5 - SouthWest Wall
AH204-04-RTN -05/08/13 15:19:56 No Leak - ZONE #1 - North East Wall
AH203-04-ALM -05/08/13 15:17:47 Leak Detected at 102 Feet - ZONE #5 - SouthWest Wall
AH202-04-RTN -05/03/13 10:45:16 No Leak - ZONE #1 - North East Wall
AH201-04-ALM -05/03/13 10:43:07 Leak Detected at 102 Feet - ZONE #5 - SouthWest Wall
AH200-02-ALM -05/01/13 14:04:56 Loss of Communications - LD1500 Leak Detection System
AH199-06-RTN -05/01/13 14:04:22 CPU Reset - power up
AH198-04-RTN -05/01/13 01:54:52 No Leak - ZONE #1 - North East Wall
AH197-04-ALM -05/01/13 01:53:48 Leak Detected at 272 Feet - ZONE #10 - North Wall (AHU-1)
AH196-04-RTN -04/30/13 17:00:44 No Leak - ZONE #1 - North East Wall
AH195-04-ALM -04/30/13 16:58:36 Leak Detected at 272 Feet - ZONE #10 - North Wall (AHU-1)
```

Figure 3.26 Alarm History Text File (.txt)

The Trend Log option provides a trending list of logged current leakage. This data provides assistance in troubleshooting leaks and inaccurate readings.

```
Trend Record_Count: 288 Total_Record_Count: 794 Buffer_Size: 288 Interval: 1440 (Minutes)

TD219-08/10/12 10:42:00 Leakage: 0 uA
TD220-08/11/12 10:45:32 Leakage: 0 uA
TD221-08/12/12 10:47:51 Leakage: 0 uA
TD222-08/13/12 10:50:10 Leakage: 0 uA
TD223-08/14/12 10:52:28 Leakage: 0 uA
TD224-08/15/12 10:54:49 Leakage: 0 uA
TD225-08/16/12 10:57:09 Leakage: 0 uA
TD226-08/17/12 10:59:38 Leakage: 0 uA
TD227-08/18/12 11:01:58 Leakage: 0 uA
TD228-08/19/12 11:04:17 Leakage: 0 uA
TD229-08/20/12 11:06:36 Leakage: 0 uA
TD230-08/21/12 11:08:58 Leakage: 0 uA
TD231-08/22/12 11:11:21 Leakage: 0 uA
TD232-08/23/12 11:13:40 Leakage: 0 uA
TD233-08/24/12 11:16:00 Leakage: 0 uA
TD234-08/25/12 11:18:18 Leakage: 0 uA
TD235-08/26/12 11:20:37 Leakage: 0 uA
TD236-08/27/12 11:22:56 Leakage: 0 uA
TD237-08/28/12 11:25:16 Leakage: 0 uA
TD238-08/29/12 11:27:35 Leakage: 0 uA
TD239-08/30/12 11:29:54 Leakage: 0 uA
```

Figure 3.27 Trend Log

3.5.   Save your Configuration

After you have configured the LD2100, save a backup of the configuration to a safe location. You can also use this backup to copy the configuration to other LD2100s that you are installing at the same time. Having a copy of the configuration can save a lot of startup time.

When you save the configuration, all parameters, including x-y coordinates for a leak detection reference map, are saved. The only item that is not saved is the map image itself. See "Save the Map Image" on page 58 for instructions for saving the map image from the LD2100.

Back Up the Configuration

To back up the configuration:

1 In the user interface, go to Configuration>System/Flash Management.

The System Management webpage displays.
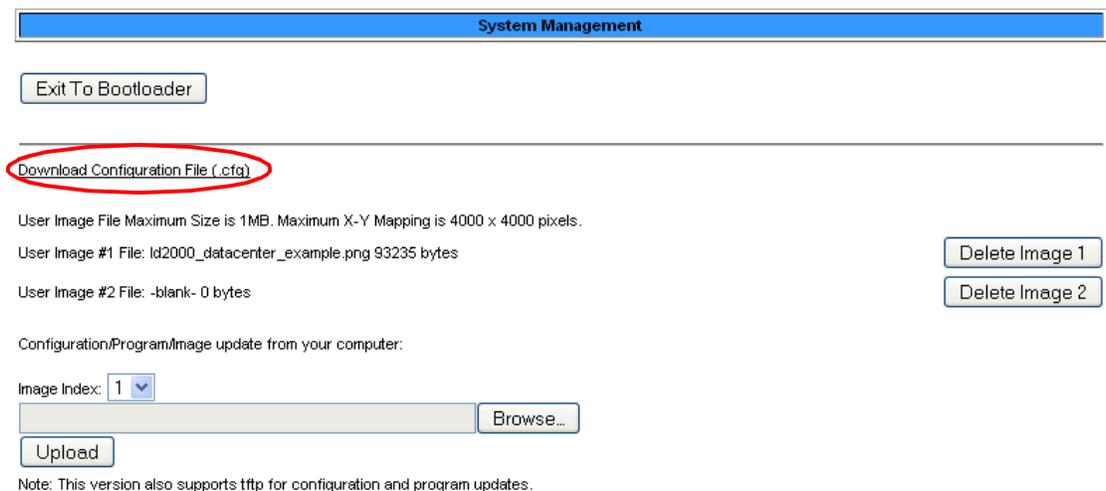
Figure 3.28 System Management Page

2 Click the Download Configuration File (.cfg) link at the top of the page.

The "Opening ld2100.cfg" pop-up for your operating system displays.

3 Select the Save File radio button and click OK.

The file is saved to your browser downloads folder, or you are prompted to select a location. Follow these guidelines for naming the configuration file:

♦ Always use the extension .cfg. If you change the extension, the LD2100 will not recognize the file if you have to upload it.

♦ The filename for the default configuration is ld2100.cfg. You can change ld2100 to a name specific to your configuration, as long as you keep the .cfg extension.

4 To upload the configuration to another LD2100, follow the same procedure used for uploading an image file. The LD2100 distinguishes between file types by the file extension (.cfg for configuration, or .jpg, .png, or .gif for an image file).

Save the Map Image

The map image is the only item that doesn't get backed up when you save the LD2100's configuration. To save a copy of the map image:

1 On the Home page of the user interface, click the button for the map you want to save. This button is underneath the map itself.
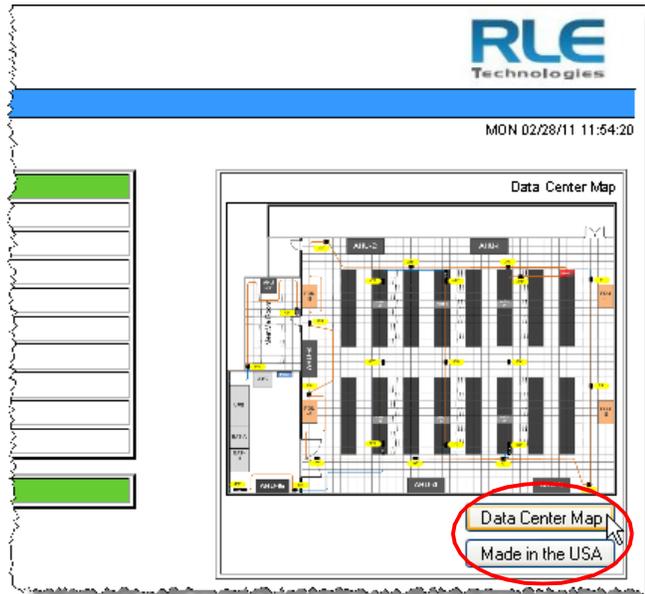
Figure 3.29 Image Buttons on Home Page

A enlarged map displays.

2 Right-click on the map image.

The Image menu for your browser displays.
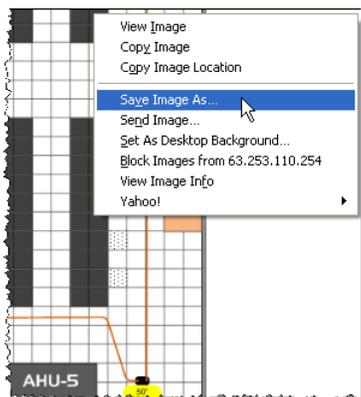
Figure 3.30 Saving a Map Image

3 Select Save Image As... from the menu.

The Save Image pop-up for your operating system displays.

4 Give the image file a name. The file extension is provided for you, based on the file type of the map you originally uploaded to the LD2100.

5 Click Save.

The map image is saved to the location and filename you specified.

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4

CONFIGURE THE LD2100 AS A MODBUS MASTER

The LD2100 can act as a Modbus master to other RLE distance-read controllers. Up to 31 RLE distance-read panels can be connected to the EIA-485 port on the LD2100. The system status can be viewed through the LD2100 web page. The LD2100 will display leak, cable break, cable contamination, and loss of communications alarms from the slave units connected to it.

4.1. Connecting Distance Read Panels Using the EIA-485 Port

When using the LD2100 as a Modbus master, the slave units must be wired to the EIA-485 port (TB4) as follows:

1 Using a two-wire configuration, connect the slave units in a **485 daisy chain**.

2 Set the EIA-485 slave address for each leak detection unit:

♦ Set the first unit to address 2.

♦ Increase the address for each subsequent unit in numeric order by one (for example, the next unit would be set to address 3)
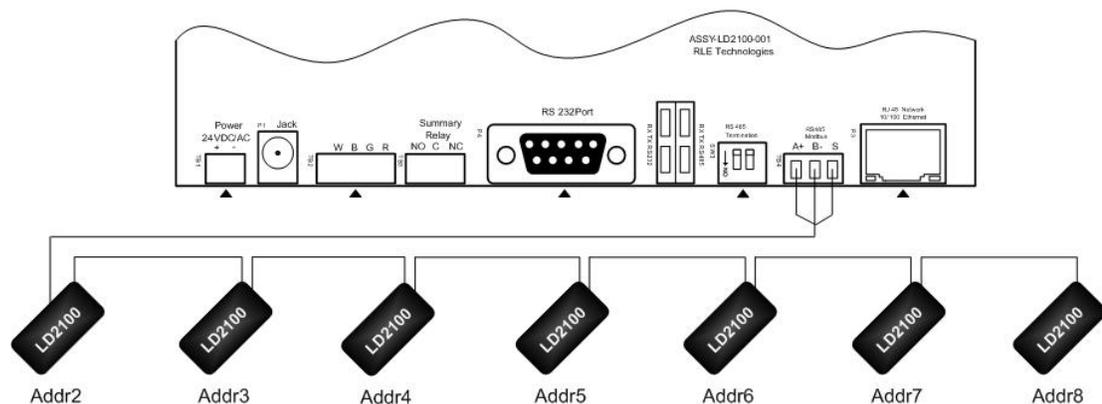
Figure 4.1 EIA-485 Connection Diagram

4.2. Connect Distance-Read Panels Through the Ethernet Port

When using the LD2100 as a Modbus master, the slave unit(s) can be connected to the LD2100 by using the local network connection, either TCP/IP or UDP/IP, as follows:

Set the TCP/IP, UDP/IP slave address for each leak detection unit with distance-read controllers that have an Ethernet port as follows:

1   Connect the slave units to the network using the Ethernet ports on the units.

2   Set the TCP/IP, UDP/IP slave address for each distance-read module connected over the Ethernet by following these guidelines:

♦ Modbus communication uses port #502 for the IP address assigned.

♦ Set the first unit connected to address 2 or higher.

♦ Increase the address for each subsequent unit in numeric order by one (for example, the next unit would be set to address 3).
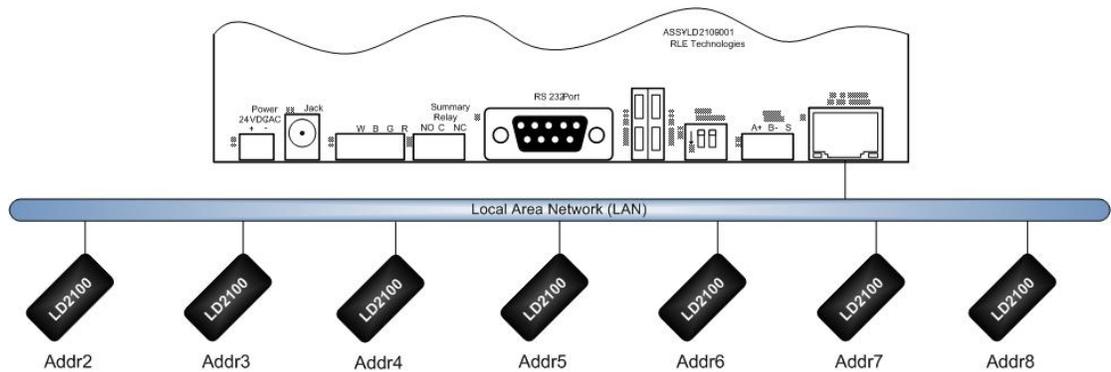
Figure 4.2   Ethernet Connection Diagram

4.3.   Configure Modbus Communications

Log into the LD2100 web interface and configure the unit to be a Modbus master:

1 From the Home page, click the Configuration link in the top bar. If using the EIA-485 port, click on EIA-485 Port/Modbus/N2.

2 Once on the Modbus/EIA-485 Configuration page, select Modbus-Master or N2 from the Select EIA-485 Port Function drop down. When completed, click on the submit changes tab.

Figure 4.3 Modbus/EIA-485 Configuration, Modbus Master

Next, configure the slave units:

3 From the LD2100 Home page, click the Configuration link in the top bar. Choose from the following options based on the configuration you want to set up:

   a Use any of the zone addresses, 1 through 32, that are still available after virtual zones have been configured.

   b If you are *not* using the virtual zone feature, check the Physical-Modbus/485 option. Trap notifications can be enabled or disabled on individual units via the Modbus/EIA-485 Configuration webpage. Click the submit changes button to save changes. Return to the Configuration webpage when finished.

Figure 4.4 Zone Configuration Webpage

4 For labeling Modbus/Physical zones, select Physical Zone Settings from the Configuration Menu.

Figure 4.5 Modbus/Physical Zone Configuration Page

5 Once on the menu, you can configure the labels for the slave units as follows:

♦ If you are using the EIA-485 wiring for communication select RS-485 from the Enable Comm Type drop down.

♦ If you are using the Ethernet port, select either Modbus TCP or Modbus UPD, depending on the module. When using the Ethernet port, add the IP address of the module to the IP Address field in the right column of the table.

6 Continue the previous step for each slave unit being configured from address 2 through 32. Click on the Submit Changes tab once finished.

7 Go to the Home page of the LD2100 and verify that the system is receiving accurate communications and proper status readings from the connected slave modules.

RLE recommends generating an alarm from each unit to confirm all communications are working properly.

Figure 4.6 LD2100 Home Page Showing Modbus Slaves

8 View the individual slave unit information by clicking on the Zone #*x* link.

Figure 4.7 Individual Slave Unit Page

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5

MODBUS COMMUNICATION

This chapter describes the Modbus communication protocol as supported by the LD2100 Distance Read System. The content includes details and information on how to configure the LD2100 for communications via Modbus network

5.1. Implementation Basics

The LD2100 is capable of communicating via the half-duplex EIA-485 serial communication standard. The LD2100 is configured to act as a slave device on a common network. The EIA-485 medium allows for multiple devices on a multi-drop network. The LD2100 is a slave only device and will never initiate a communications sequence.

5.1.1 Modes of Transmission

The Modbus protocol uses ASCII and RTU modes of transmission. The LD2100 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)

5.1.1.1 Slave Address Field

The slave address field is one byte in length and identifies the slave device involved in the transaction. A valid address range is between 1 and 254. The slave address is set from the **Modbus/EIA-485 Configuration** web page (see).

5.1.1.2 Function Field

The function field is one byte in length and tells the LD2100 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).

5.1.1.3 Data Field

The data field of the request is a variable length depending on the function. The data fields for the LD2100 are 16-bit registers, transmitted high order byte first (big-endian).

5.1.1.4 Error Check (Checksum) Field

The checksum field lets the receiving device determine if the packet has transmission errors. The LD2100 RTU mode uses a 16-bit cyclic redundancy check (CRC-16).

5.1.1.5 5-1.2 Exception Responses

If a Modbus master sends an invalid command to the LD2100 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 5.1   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

5.2.   Packet Communications for the LD2100

This section covers the registers with the name and a brief description of each.

5.2.1 Function 03: Read Output Registers

To read the LD2100 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 5.2   Read Output Register 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)
	…
	Cry Checksum (2 bytes)

Table 5.3   Output Registers

Register	Name	Description	Units	Range
40001	Leak Threshold	Trip current for leak alarm	25-295 uAmps	0-65535
40002	Contamination Threshold	Trip current for contamination alarm	20-295 uAmps	0-65535
40003	Re-Alarm Delay	The time that elapses between when an alarm is detected and when it is annunciated	0-24 Hours	0-65535
40004	Latching Alarms	Designate the alarms as latching or non-latching	0=No, 1=Yes	0-65535
40005	Silence Audible Alarm	Silence the audible alarm	1=Silenced	0-65535
40006	Reset Alarms	Reset all the alarms	1=Reset	0-65535
40007	Spare			0-65535
40008	Spare			0-65535
40009	Spare			0-65535
40010	Spare			0-65535

Table 5.3 Output Registers

Register	Name	Description	Units	Range
40011	Spare			0-65535
40012	Spare			0-65535
40013	Spare			0-65535
40014	Spare			0-65535
40015	Spare			0-65535
40016	Leak Alarm Delay	Leak Alarm Delay	5-995 seconds	0-65535
40017	Contamination Alarm Delay	Contamination Alarm Delay	5-995 seconds	0-65535

5.2.2 Function 04: Read Input Registers

To read the LD2100 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 (30001 = zero, 30002 = one, etc).

Table 5.4 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)
	…
	Cry Checksum (2 bytes)

Table 5.5 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

Table 5.5 Input Registers (continued)

Register	Name	Description	Units	Range
30009	Version	Firmware version	xx.xx X 100	0-65535
30010	Virtual Zone Alarm Status	Bit Level Status	None	0-65535
30011	Modbus Zone Enabled Flags	Bit Level Status	None	0-65535
30012	Modbus Zone2 Status	Bit Level Status	None	0-65535
30013	Modbus Zone2 Distance	Location of leak	Ft/Meters	0-65535
30014	Modbus Zone3 Status	Bit Level Status	None	0-65535
30015	Modbus Zone3 Distance	Location of leak	Ft/Meters	0-65535
30016	Modbus Zone4 Status	Bit Level Status	None	0-65535
30017	Modbus Zone4 Distance	Location of leak	Ft/Meters	0-65535
30018	Modbus Zone5 Status	Bit Level Status	None	0-65535
30019	Modbus Zone5 Distance	Location of leak	Ft/Meters	0-65535
30020	Modbus Zone6 Status	Bit Level Status	None	0-65535
30021	Modbus Zone6 Distance	Location of leak	Ft/Meters	0-65535
30022	Modbus Zone7 Status	Bit Level Status	None	0-65535
30023	Modbus Zone7 Distance	Location of leak	Ft/Meters	0-65535
30024	Modbus Zone8 Status	Bit Level Status	None	0-65535
30025	Modbus Zone8 Distance	Location of leak	Ft/Meters	0-65535
30026	Modbus Zone9 Status	Bit Level Status	None	0-65535
30027	Modbus Zone9 Distance	Location of leak	Ft/Meters	0-65535
30028	Modbus Zone10 Status	Bit Level Status	None	0-65535
30029	Modbus Zone10 Distance	Location of leak	Ft/Meters	0-65535
30030	Modbus Zone11 Status	Bit Level Status	None	0-65535
30031	Modbus Zone11 Distance	Location of leak	Ft/Meters	0-65535
30032	Modbus Zone12 Status	Bit Level Status	None	0-65535
30033	Modbus Zone12 Distance	Location of leak	Ft/Meters	0-65535
30034	Modbus Zone13 Status	Bit Level Status	None	0-65535
30035	Modbus Zone13 Distance	Location of leak	Ft/Meters	0-65535
30036	Modbus Zone14 Status	Bit Level Status	None	0-65535
30037	Modbus Zone14 Distance	Location of leak	Ft/Meters	0-65535
30038	Modbus Zone15 Status	Bit Level Status	None	0-65535
30039	Modbus Zone15 Distance	Location of leak	Ft/Meters	0-65535

Table 5.5 Input Registers (continued)

Register	Name	Description	Units	Range
30040	Modbus Zone16 Status	Bit Level Status	None	0-65535
30041	Modbus Zone16 Distance	Location of leak	Ft/Meters	0-65535
Registers 30011 through 30041 are dedicated registers for Modbus Master; see Chapter 4 on page 61 for details.				
30042	Modbus Zone Enabled Flags	Bit Level Status	None	0-65535
30043	Modbus Zone17 Status	Bit Level Status	None	0-65535
30044	Modbus Zone17 Distance	Location of leak	Ft/Meters	0-65535
30045	Modbus Zone18 Status	Bit Level Status	None	0-65535
30046	Modbus Zone18 Distance	Location of leak	Ft/Meters	0-65535
30047	Modbus Zone19 Status	Bit Level Status	None	0-65535
30048	Modbus Zone19 Distance	Location of leak	Ft/Meters	0-65535
30049	Modbus Zone20 Status	Bit Level Status	None	0-65535
30050	Modbus Zone20 Distance	Location of leak	Ft/Meters	0-65535
30051	Modbus Zone21 Status	Bit Level Status	None	0-65535
30052	Modbus Zone21 Distance	Location of leak	Ft/Meters	0-65535
30053	Modbus Zone22 Status	Bit Level Status	None	0-65535
30054	Modbus Zone22 Distance	Location of leak	Ft/Meters	0-65535
30055	Modbus Zone23 Status	Bit Level Status	None	0-65535
30056	Modbus Zone23 Distance	Location of leak	Ft/Meters	0-65535
30057	Modbus Zone24 Status	Bit Level Status	None	0-65535
30058	Modbus Zone24 Distance	Location of leak	Ft/Meters	0-65535
30059	Modbus Zone25 Status	Bit Level Status	None	0-65535
30060	Modbus Zone25 Distance	Location of leak	Ft/Meters	0-65535
30061	Modbus Zone26 Status	Bit Level Status	None	0-65535
30062	Modbus Zone26 Distance	Location of leak	Ft/Meters	0-65535
30063	Modbus Zone27 Status	Bit Level Status	None	0-65535
30064	Modbus Zone27 Distance	Location of leak	Ft/Meters	0-65535
30065	Modbus Zone28 Status	Bit Level Status	None	0-65535

Table 5.5 Input Registers (continued)

Register	Name	Description	Units	Range
30066	Modbus Zone28 Distance	Location of leak	Ft/Meters	0-65535
30067	Modbus Zone29 Status	Bit Level Status	None	0-65535
30068	Modbus Zone29 Distance	Location of leak	Ft/Meters	0-65535
30069	Modbus Zone30 Status	Bit Level Status	None	0-65535
30070	Modbus Zone30 Distance	Location of leak	Ft/Meters	0-65535
30071	Modbus Zone31 Status	Bit Level Status	None	0-65535
30072	Modbus Zone31 Distance	Location of leak	Ft/Meters	0-65535
30073	Modbus Zone32 Status	Bit Level Status	None	0-65535
30074	Modbus Zone32 Distance	Location of leak	Ft/Meters	0-65535
30075	Virtual Zone Alarm Status	Bit Level Status	None	0-65535

Table 5.6 Status Flags (Register 30001)

Bit	Description
00	1 = Leak is Detected
01	1 = Cable Break Alarm
02	1 = Contamination is detected
04-15	Spare

Table 5.7   Status Flags (Register 30010)

Bit	Description
00	1 = Zone1
01	1 = Zone2
02	1 = Zone3
03	1 = Zone4
04	1 = Zone5
05	1 = Zone6
06	1 = Zone7
07	1 = Zone8
08	1 = Zone9
09	1 = Zone10
10	1 = Zone11
11	1 = Zone12
12	1 = Zone13
13	1 = Zone14
14	1 = Zone15
15	1 = Zone16

Table 5.8 Status Flags (Register 30011)

Bit	Description
00	1 = Not enabled
01	1 = Enabled, b1=MBZ2
02	1 = MBZ3
03	1 = MBZ4
04	1 = MBZ5
05	1 = MBZ6
06	1 = MBZ7
07	1 = MBZ8
08	1 = MBZ9
09	1 = MBZ10
10	1 = MBZ11
11	1 = MBZ12
12	1 = MBZ13
13	1 = MBZ14
14	1 = MBZ15
15	1 = MBZ16

Table 5.9 Status Flags (Even Registers 30012-30040)

Bit	Description
00	1= Leak Alarm
01	1 = Cable Break
02	1 = Contamination Alarm
07	1 = Communication Loss

Table 5.10 Status Flags (Register 30042)

Bit	Description
00	1 = MBZ17
01	1 = MBZ18
02	1 = MBZ19
03	1 = MBZ20
04	1 = MBZ21
05	1 = MBZ22
06	1 = MBZ23
07	1 = MBZ24
08	1 = MBZ25
09	1 = MBZ26
10	1 = MBZ27
11	1 = MBZ28
12	1 = MBZ29
13	1 = MBZ30
14	1 = MBZ31
15	1 = MBZ32

Table 5.11 Status Flags (Register 30075)

Bit	Description
00	1 = Zone17
01	1 = Zone18
02	1 = Zone19
03	1 = Zone20
04	1 = Zone21
05	1 = Zone22
06	1 = Zone23
07	1 = Zone24
08	1 = Zone25
09	1 = Zone26
10	1 = Zone27
11	1 = Zone28
12	1 = Zone29
13	1 = Zone30
14	1 = Zone31
15	1 = Zone32

5.2.3 Function 06: Preset Single Register

To set a LD2100 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 5.12 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)
Cry Checksum (2 bytes)	Cry Checksum (2 bytes)

5.2.4 Function 16: Preset Multiple Registers

To set multiple LD2100 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 5.13 Preset Multiple Registers Packet Structure

Preset Registers Request Packet	Preset Registers Response Packet
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)	
…	
…	
Cry Checksum (2 bytes)	

5.3.   RTU Framing

The example below shows a typical Query/Response from an LD2100 module.

Table 5.14 Response Sample

Slave Address	Function Code	Count Bytes of Data	Register Data Msb	Lsb	Register Data Msb	Lsb	Register Data Msb	Lsb	CRC 16 "Lsb"	CRC 126 "Msb"
02	04	06	00	00	00	00	00	01	B5	A3

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

Register Values:

40001 = 0000 (hex)
40002 = 0000 (hex)
40003 = 0001 (hex)

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 LD2100 to a reference map (if available) to verify that the LD2100 displays the correct leak location. See Chapter 2 on page 13 for more information about calibrating the leak detection cable.

4 Dry the cable and verify that the LD2100 returns to normal.

5 Remove the End-of-Line terminator (EOL).

6 Verify the Cable Break alarm on the control panel.

7 Reinstall the EOL.

8 Verify that the LD2100 returns to normal.

9 Monitor the cable current monthly to verify that the cable is not being contaminated. The LD2100 will alarm on cable contamination if the contamination is excessive.

10 From the LD2100 Web interface, verify that the Cable Current is less than 25μA. If the cable current is greater than 25μA, troubleshoot the cables to determine which cable is contaminated. The contaminated cable should be removed, cleaned, and retested.

LD2100 User Guide

7

TROUBLESHOOTING

Problem	Action
Control Panel will not Power Up	1 Check with a DVOM (multi-meter) for AC or DC input power on the lower left hand terminal block on the LD2100. If no voltage is present at terminal block, check the circuit (breaker) or power supply the LD2100 control panel is powered by. If voltage is present, go to step 2.
	2 Contact RLE Technologies for unit replacement and/or evaluation. If voltage is present and no LED's are illuminated, contact RLE Technologies for further troubleshooting.
Cable Break Alarm	1 Verify that the leader cable from the sensing cable run is plugged into terminal block marked "Cable."
	2 Verify that the End-of-Line terminator (EOL) is installed on the end of the orange sensing cable run. If present at the end of the cable run, go to step 3.
	3 Remove the EOL 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 sensing cable. Start moving the EOL terminator to the end of each section of sensing cable to isolate the faulty section. If the condition does not clear, go to step 4.
	4 Power down (shut off) the control panel. Remove terminal block marked "Cable" from the unit. 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.

Table 7.1   Troubleshooting

Problem	Action
Control Panel not Calculating Proper Length of Cable	1 First verify the proper wiring order into terminal block marked "Cable." 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 (Configuration menu via the Web Interface). 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 (EOL) from the end of the sensing cable. Locate the first section of sensing cable from the LD2100 control panel. Where it joins to the second section of cable, disconnect and install the EOL terminator at the end of the first section of sensing 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 sensing cable. If the leak is calculated correctly, remove the EOL terminator; reconnect the sensing 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 LD2100 unit, please contact RLE Technologies for support.
Cable Contamination Alarm	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 LD2100 before reinstalling it under the floor.

Table 7.1   Troubleshooting (continued)

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.

7.1. Restoring Factory Defaults

On rare occasions, you might need to set the LD2100's configuration to the factory defaults. For example, if you need to relocate the LD2100 to a new facility that needs a different configuration for the LD2100, it could make sense to start with factory defaults and then adjust the configuration as required for the new location.

To restore factory defaults to the LD2100:

1 First, save a copy of the current configuration in case you need to re-load it. See "Save your Configuration" on page 57 for instructions.

2 In the user interface, go to Configuration>System/Flash Management.
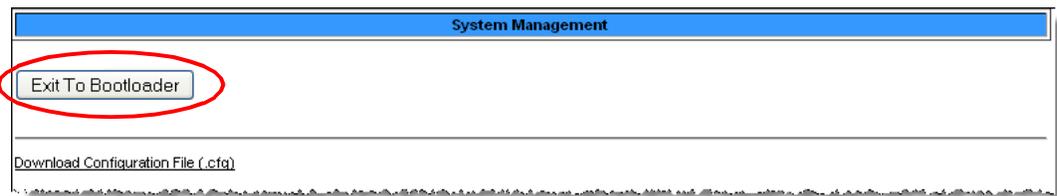
Figure 7.1 Exit to Bootloader Button on System Management Web Page

3 Click the Exit to Bootloader Button.

The Bootloader web page displays.

Figure 7.2 Bootloader Page

4 Click the Restore Factory Defaults button.

The settings are restored to their defaults.

5 If you saved the .cfg file before restoring the LD2100 to its default settings, you can re-load the .cfg file to bring back the previous configuration. Follow the same procedure used for uploading an image file. The LD2100 distinguishes between file types by the file extension (.cfg for configuration, or .jpg, .png, or .gif for an image file).

A

UPDATE FIRMWARE

Firmware updates are available on the Resources page of the RLE Web site at www.rletech.com. Download appropriate firmware to an accessible place to load it to the LD2100 using a LAN connection.

The instructions in this appendix describe how to load firmware using the LD2100's MIME (Multipurpose Internet Mail Extensions) feature. As an alternative, instructions are provided for using TFTP (Trivial File Transfer Protocol). Use MIME if you are able; it is the more efficient method.

A.1.   Preliminary Steps

To load firmware to the LD2100 using either MIME or TFTP, first locate the correct firmware:

1   Go to the RLE Web site Resources page at http://www.rletech.com/resources/.

2   Scroll down to the SeaHawk section and locate the firmware (a .bin file) for the LD2100.

3   *Using the same filename*, save the firmware to a local disk.

IMPORTANT   Do not change the name of the firmware file when you save it. Otherwise, the LD2100 will not recognize the file.

A.2. Loading Flash Firmware Using MIME

To use MIME to load the firmware:

1 On the LD2100 interface, go to Configuration>System/Flash Management.
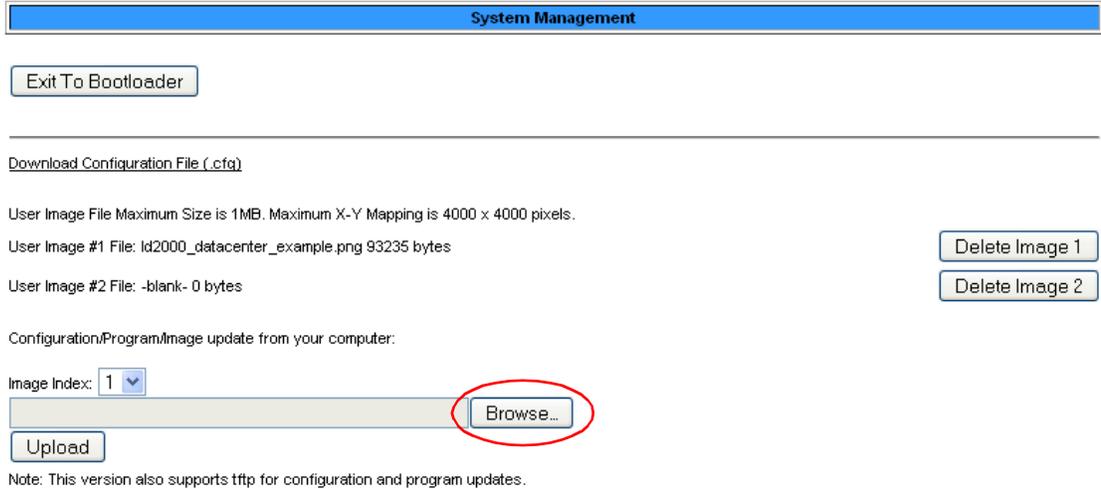

Figure A.1 System Management Page

2 Click the Browse button.

3 Locate and choose the firmware file (.bin) that you saved from the RLE website.

The path and name of the firmware file (.bin) displays in the field to the left of the Browse button.
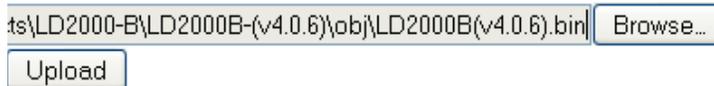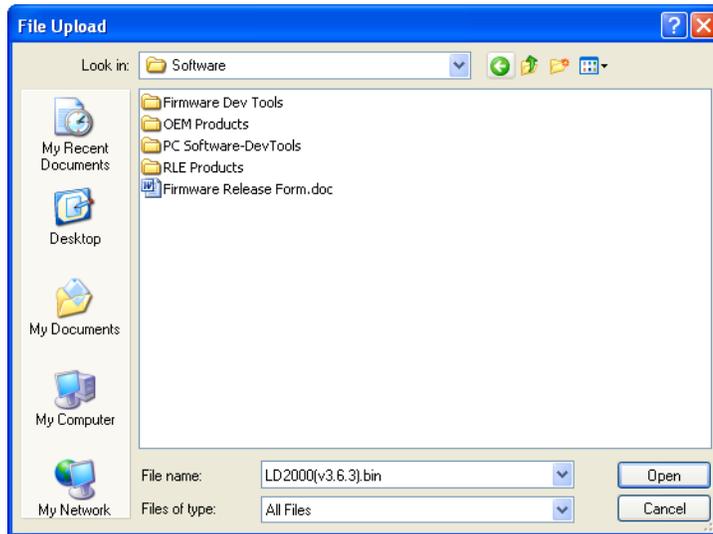
Figure A.2 Choosing a Firmware File

4 Click the Upload button.

The firmware is loaded while the LD2100 displays a message confirming that it is loading the new file.

File has been uploaded and copied to flash

If your browser does not automatically redirect you, please click here.

Figure A.3 Firmware Load Messages

5 If the system does not reboot on its own, click the here link to display the LD2100 Home page.

6 You can verify which firmware version is loaded by clicking the Identity link on the top bar and looking at the value for the field called Flash Application.

Model	LD2100
Flash Application	LD2100 V4.0.4
Flash Appl. Size	402316
Bootloader Version	LD21000 BOOT V4.0.3
MAC Address	00:90:5B:09:06:7A
IP Address	63.253.110.254
Net Mask	255.255.255.240
Def Route	63.253.110.241
sysUpTime	1 days 23 hrs 6 mins 18 secs
System Name	RLE LD2100 Web Demo
System Contact	Ted Fletcher - tfletcher@rletech.com - (970) 232.3940
System Location	RLE Technologies, 104 Racquette Drive, Fort Collins, CO 80524

Figure A.4 Current Firmware Version As Shown in LD2100 Interface

A.3. Loading Flash Firmware Using TFTP

Before updating the firmware, the firmware flash application must be exited and then erased. To do this, navigate to the LD2100's System Management menu. Once here, click on the "Exit to Bootloader" button (you must have write access to the unit in order to accomplish this task). Once exited, you will get a bootloader webpage at the IP address of the unit. Next, click on the "Erase Flash" button. The Flash application will be erased.

Note To erase the flash, a special username and password are required:
Username: LD2100 (all lowercase)
Password: rle2tech (all lowercase)

1 Uploading firmware via TFTP requires a TFTP Client. It may be possible to download a free license TFTP client from the internet. Consult your IT department to determine a compatible client program.

2 Verify that your PC and the LD2100 are on the same subnetwork (LAN).

3 Open your TFTP client. Configure the client as follows.

    a **Host** = LD2100 IP Address

    b **Port** = 69

    c **Block Size** = 64, 128, 256, 512, or 1024

Note The file must be sent in binary (not ASCII).

4 Send or Put the firmware file to the LD2100. It may take ~10 seconds for the firmware upload to begin. This will put the new firmware into effect.

5 After one minute, refresh the LD2100 webpage. Notice that the Flash field now contains the latest firmware. Click the "Start Application" button to reboot the unit.

Model	LD2100
Flash Application	LD2100 V4.0.4
Flash Appl. Size	402316
Bootloader Version	LD21000 BOOT V4.0.3
MAC Address	00:90:5B:09:06:7A
IP Address	63.253.110.254
Net Mask	255.255.255.240
Def Route	63.253.110.241
sysUpTime	1 days 23 hrs 6 mins 18 secs
System Name	RLE LD2100 Web Demo
System Contact	Ted Fletcher - tfletcher@rletech.com - (970) 232.3940
System Location	RLE Technologies, 104 Racquette Drive, Fort Collins, CO 80524

Figure A.5 Current Firmware Version As Shown in LD2100 Interface

B

TECHNICAL SPECIFICATIONS

Table B.1   Technical Specifications

Power		Requires an isolated power supply.
		24VDC Isolated @ 600mA max, 50/60Hz; requires RLE power supply PSWA-DC-24 (not included)
		24VAC Isolated @ 600mA max; requires RLE power supply: WA-AC-24 (not included)
Inputs		
	Water Leak Detection Cable	Compatible with SeaHawk sensing cable (not included)
	Cable Input	LC-KIT: 15ft (4.57m) leader cable and EOL (included)
	Recommended Maximum Length	5,000ft (609m)
	Detection Accuracy	± 2ft (0.6m)+/- 0.5% of the cable length
	Detection Repeatability	± 2ft (0.6m) +/- 0.25% of the cable length
	Detection Response Time	5-995sec, software adjustable in 5sec increments; ±2sec
Outputs		
	Relay	1 Form C summary relay; 1A @ 24VDC, 0.5A resistive @ 120VAC; configurable for latched or non-latched
Communications Ports		
	Ethernet	10/100 BaseT, RJ45 connector; 500VAC RMS isolation
	EIA-232	DB9 female connector; 9600 baud; No parity, 8 data bits, 1 stop bit
	EIA-485	9600, 19200, 38400, or 56700 baud (selectable); Parity: none, even or odd, 8 data bits, 1 stop bit
Protocols		
	TCP/IP, HTML, TFTP	IPv4.0; webpages comply with Rehabilitation Act of 1973, sections 504 and 508, US Dept of Education (website accessibility for computer users with disabilities)
	SNMP	V1: V2C MIB-2 compliant; NMS Manageable with Get, Set, Traps: V3

Table B.1 Technical Specifications (continued)

	SMTP (Email)	Supports Client Authentication (plain and login); compatible with ESMTP Servers
	Modbus EIA-485	Slave; RTU Mode; Supports function codes 03, 04, 06 and 16; RTU mode for integration with RLE's LD5100, LD2100, LD2000, and LD1500 products only; Johnson N2
	Modbus TCP/IP	Modbus Slave; TCP/IP transmission protocol; TCP/IP transmission protocol for integration with RLE's LD2100, LD2000, and LD1500 products only
	BACnet/IP	ASHRAE STD 135-2004 Annex J; PICS - protocol implementation conformance statement
	BACnet MS/TP	EIA-485
	Terminal Emulation (RS-232)	VT100 compatible
Alarm Notification		
	Audible Alarm	70dBA @ 2ft (0.6m); re-sound configurable (0-24 hrs., integer)
	Visual Alarm	Alphanumeric, 8-character dot matrix LED display; bi-color status LED
	Email (Ethernet)	4 Email recipients; email sent on Alarm and Return to Normal; each alarm notifies all email recipients
	SNMP Traps (Ethernet)	4 Community Strings
Logging Capabilities		
	Event Log	Last 500 events
	Trend Log	Cable current level every day, for the last 288 days
Login Security		
	Web Browser Access (Ethernet)	1 Web password Read Only; 1 Web password Read/Write
	Terminal Emulation Access	None
Front Panel Interface		
	Display	Alphanumeric, 8-character dot matrix LED display; bi-color status LED
	Push Buttons	Test/Reset: 1
	LED Indicators	Power/Status: 1 bi-color (Power On: green; Alarm: red)
Operating Environment		
	Temperature	32° to 122°F (0° to 50°C)
	Humidity	5% to 95% RH, non-condensing
	Altitude	15,000ft (4,572m) max.
Storage Environment		-4° to 185°F (-20° to 85°C)
Dimensions		8.0"W x 4.25"H x 1.25"D (203mmW x 108mmH x31.75mmD)
Weight		1.5 lbs. (680g)
Mounting		Wall mountable; wall-mount enclosure LD-ENC or LD-ENC-NP (optional)
Certifications		CE; ETL listed: conforms to UL STD 61010-1, EN STD 61010-1; certified to CSA C22.2 STD NO. 61010-1; RoHS compliant