Liebert® Liqui-tect™ LP6000 Leak-Detection System

Installer/User Guide

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Technical Support Site

If you encounter any installation or operational issues with your product, check the pertinent section of this manual to see if the issue can be resolved by following outlined procedures.

Visit https://www.vertiv.com/en-us/support/ for additional assistance.

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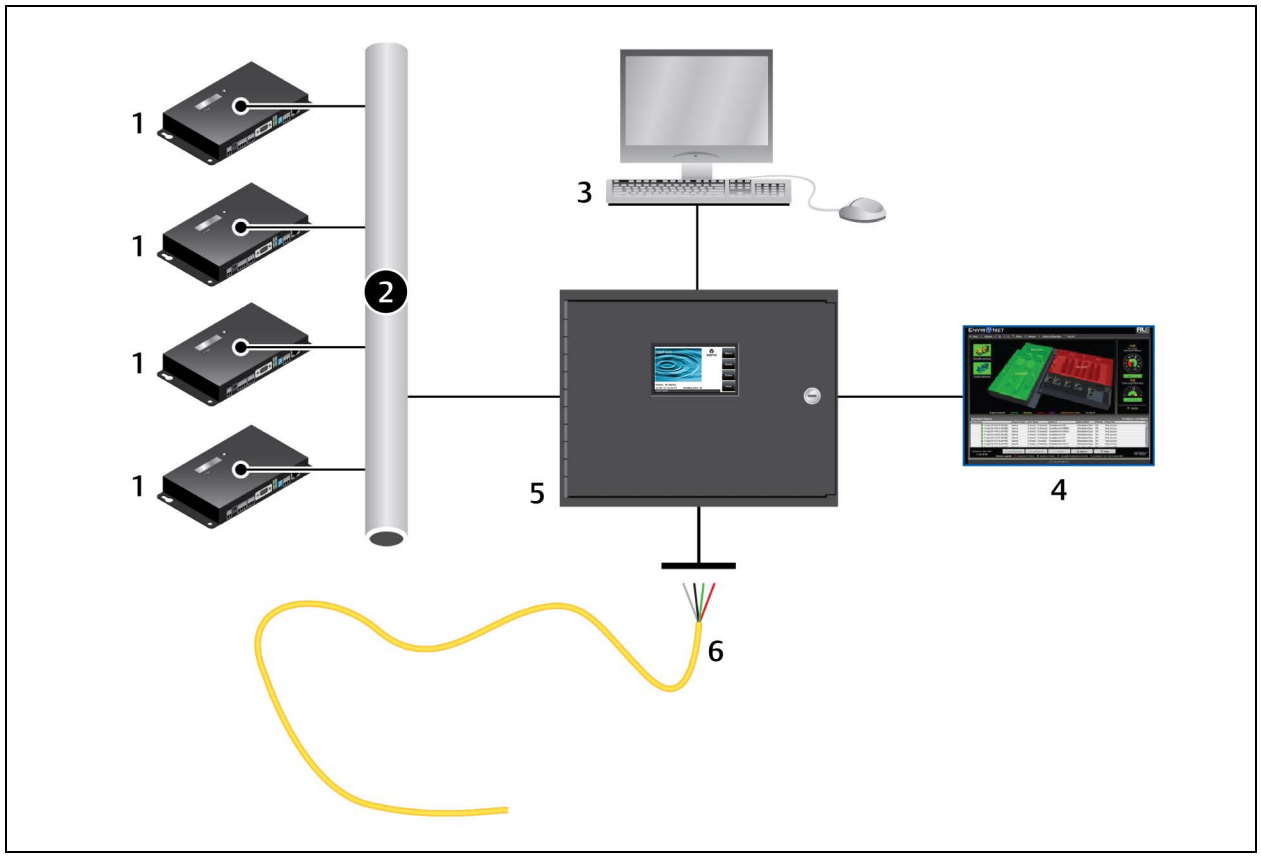
1 Product Description

The Vertiv™ Liebert® Liqui-tect™ LP6000 is a complete monitoring system that reports the presence of water and other conductive liquids. Liebert® Liqui-tect™ LP6000 is an advanced leak-detection controller that monitors up to 10,000 ft (3048 m) of sensing cable. When a conductive liquid comes in contact with the sensing cable:

- An audible alarm sounds.
- The distance to the leak is shown on the LCD display and via the web user interface.
- Alarm notifications may be distributed via Modbus/BACnet/SNMP/SMTP.

Figure 1.1 LP6000 Leak-Detection System and Communication Overview



Item	Description
1	Secondary Liebert® Liqui-tect™ devices
2	Network connection (EIA-485 connection also available)
3	Web user interface
4	BMS/NMS
5	LP6000 panel
6	Leak-detection cable

1.1 Supervised System

Vertiv™ Liebert® Liqui-tect™ LP6000 is a supervised system, which means that it continuously monitors for leaks and other fault conditions, including a cable break and cable contamination, that trigger an alarm. When a leak or fault is detected, a relay is activated, and LP6000 sends alarm notifications to predetermined recipients via the configured communication method.

Table 1.1 System Features

Feature	Descriptions
Input Power	Hardwired 100 – 240 VAC, 500 mA max, 50/60 Hz; dedicated circuit.
Included Accessories	15' Connection cable and end terminator
Leak Detection Input (1)	
Maximum Cable Length	10,000 ft (3,048 m) of LT500 Leak Detection Cable
Minimum Cable Length	35 ft (10.67 m)
Detection Accuracy	± 2 ft (0.6 m) ±0.5% of the cable length
Detection Repeatability	± 2 ft (0.6 m) ± 0.25% of the cable length
Detection Response Time	5 – 995 sec, software adjustable in 5-sec increments; ±2 sec
Outputs	
Form C dry-contact Relay	2-Leak, 2-Cable Break, 1-Maintenance, 1 A @ 24 VDC; 0.5 A @ 120 VAC; Latched or non-latched
Communications Ports	
EIA-485 (3 ports)	9600, 19200, or 38400 baud (selectable); No parity, 8 data bits, 1 stop bit
RJ-45	10/100 BaseT Ethernet port (TCP/IP)
Local Display	480 x 272 pixel, color, back-lit LCD touch screen; 95.04 mm x 53.85 mm
Protocols	
TCP/IP, HTML	IPv4.0
SNMP	V1: V2C MIB-2 compliant: V3
SMTP	Supports Client Authentication (plain and login); compatible with ESMTP Servers
Modbus	Modbus RTU and Modbus TCP/UDP; Primary & Secondary
BACnet	BACnet MS/TCP and BACnet/IP
Alarm Notification	
Audible Alarm	85 dBA @ 2 ft (0.6 m); 0 – 999 minutes
Visible Alarm	Alarm indicated on LCD touch screen and through web interface
Email	4 Email recipients; email sent to all recipients on Alarm and Return to Normal
SNMP Traps	4 IP Addresses
Logging Capabilities	
Event Log	Last 1,024 events, downloadable to .txt file
Trend Log	Cable current level every day, for the last 365 days

Table 1.1 System Features (continued)

Feature	Descriptions
Login Security	
Web Access	Two (2) passwords; One (1) Read-only; One (1) Read/Write
Operating Environment	
Temperature	32° to 122°F (0° to 50°C)
Humidity	5% to 95% RH, non-condensing
Altitude	15,000 ft (4,572 m) max.
Storage Environment	–4° to 158°F (–20° to 70°C)
Enclosure	Wall mount, NEMA Type 1
Dimensions	12.5 in. W x 10 in. H x 3.25 in. D (318 mm W x 254 mm H x 83 mm D)
Weight	8.2 lb (3.7 kg)
Certifications	CE; ETL listed: conforms to UL 61010-1, EN 61010-1; certified to CSA C22.2 NO. 61010-1; RoHS compliance

1.2 Distance Read Leak Detection

When the Vertiv™ Liebert® Liqui-tect™ LP6000 measures a current in excess of the defined leak threshold, the microprocessor computes the distance to the leak, annunciates the leak, and logs the alarm in the event log. The leak is communicated via the front-panel display and other configured notification methods.

1.3 Communication with Vertiv™ Liebert® Liqui-tect™ LP6000

The front-panel display is an LCD touch screen with virtual buttons providing access to all functions of a stand-alone unit.

A Web-based user interface (UI) provides access to system conditions and settings on-site or via network communication.

In addition to the web-based UI, LP6000 communicates with external monitoring systems via the following outputs:

- Modbus via EIA-485, twisted-pair wire, or TCP/IP
- BACnet/IP or BACnet/MSTP
- SNMP
- SMTP

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2 Preparation and Installing the Vertiv™ Liebert® Liqui-tect™ System

Installing the Liebert® Liqui-tect™ system involves the following preparation before beginning:

- Choosing a readily-accessible location for the controller.
- Preparing the appropriate connections for power, leak detection, and communication.
- Consulting with your IT administrator to determine the following network settings for the LP6000 controller:
  - IP address
  - Subnet mask
  - Default gateway
- Creating a leak-detection cable layout diagram that considers the equipment in the area that may be damaged by water and the possible sources of leaks. Plan the cable layout to alert personnel when electronic equipment is threatened by a leak. An example of a layout diagram is included in Laying the Leak-Detection Cable and Securing to the Floor on page 7 .

Required Equipment and Supplies:

The following is included:

- Liebert® Liqui-tect™ LP6000 controller
- CONNECT15 connection cable
- LT500-ET end terminator
- Screws and anchors for wall mounting

The following equipment is sold separately:

- Leak-detection cable(s) of chosen length, 15-ft, 35-ft, or 50-ft

The following tools may be field-supplied, if needed:

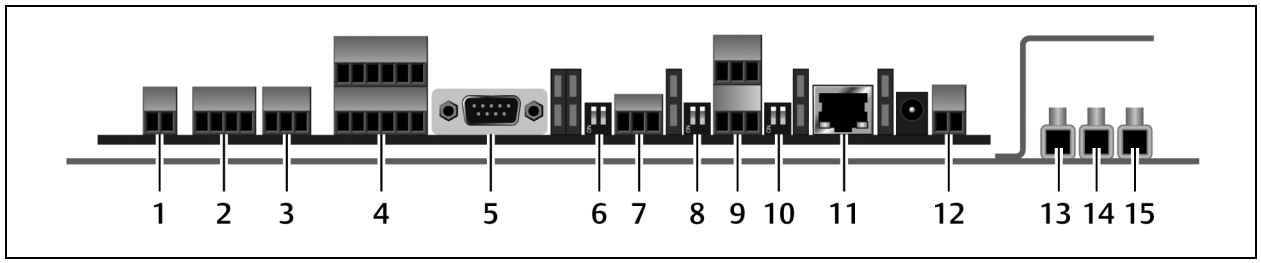
- Electric drill (to drive screws or drill pilot holes)
- Screw driver
- Marker/Pencil to mark screw locations

2.1 Mounting the LP6000 Controller on a Wall

1. In the location determined during preparation, mark the wall for the mounting holes using the unit as a template.
2. If necessary, drill holes for the 4 screws that will secure the unit to the wall.
   - If the wall material is not strong enough, use the supplied wall anchors.
   - Clean up debris from drilling.
3. Install the 2 top screws, and hang the unit on the screws, allowing it to slip down so the screws are in the smaller part of the pear-shaped slot.
4. Tighten the screws until snug.
5. Insert the remaining 2 screws in the bottom holes and tighten.

2.2 Input and Output Connectors

Figure 2.1 Connections and Switches on LP6000



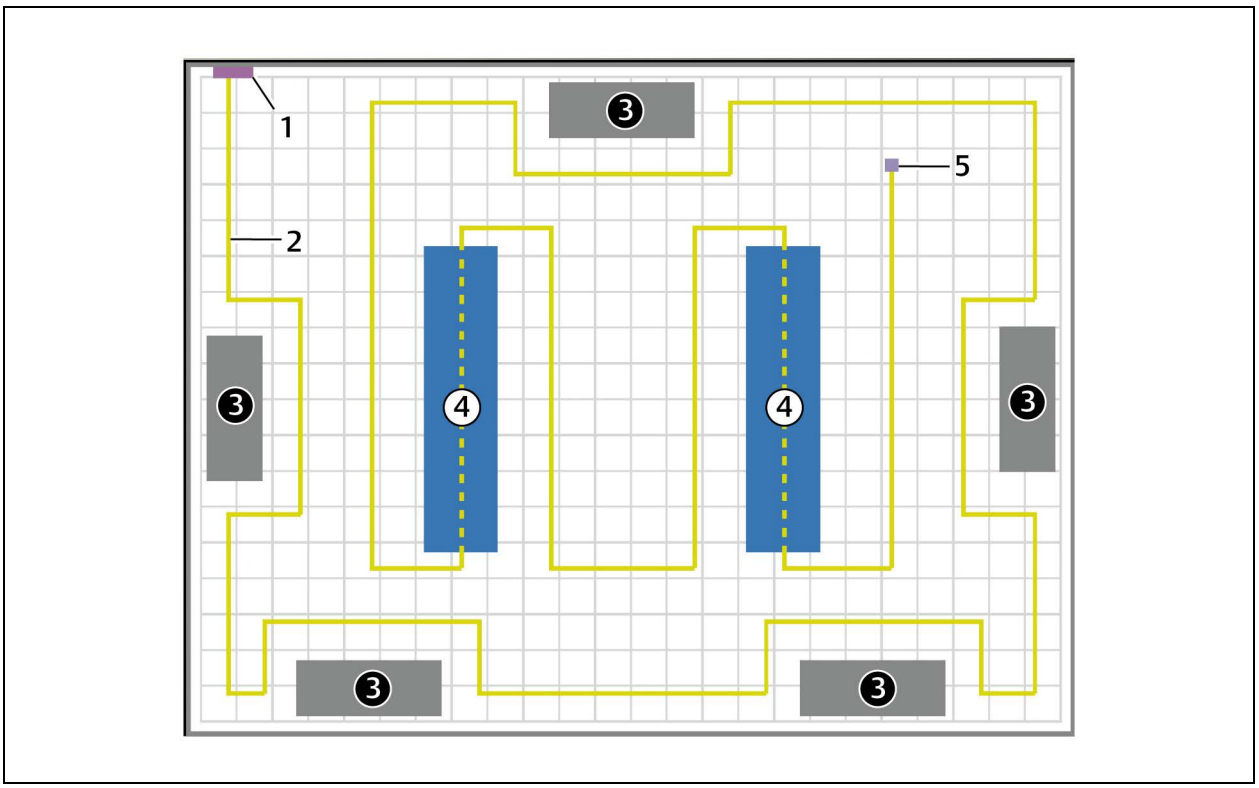
Item	Description
1	TB1 - 4 mA to 20 mA Output
2	TB2 - Cable Interface (W-B-G-R)
3	TB3 - Form C Maintenance Relay
4	TB4 - (2) Form C Leak Relay Outputs and (2) Form C Fault Relay Outputs
5	P1 - EIA-232 Connector
6	SW1 - EIA-485 Port 3 Termination
7	TB5 - EIA-485 Port 3
8	SW2 - EIA-485 Port 2 Termination
9	TB6: Top - EIA-485 Port 1 Bottom - EIA-485 Port 2
10	SW3 - EIA-485 Port 1 Termination
11	P2 - Ethernet Port
12	TB7 - Input Power (from the power supply)
13	Neutral - Power-input terminal block
14	Line - Power-input terminal block
15	Ground - Power-input terminal block

2.3 Laying the Leak-Detection Cable and Securing to the Floor

Refer to the site layout diagram for your installation, an example is shown in the following figure, and route the cable as indicated.

- The leak-detection cable may be placed in the ceiling if there is a liquid source to monitor.
- The cable may also be placed beneath a raised floor.

Figure 2.2 Example Leak-Detection Cable Layout Diagram



Item	Description
1	Liebert® Liqui-tect™ leak-detection monitoring system
2	Leak-detection cable (yellow)
3	Air-conditioning/Environmental units
4	Computer/Equipment rack
5	End terminator (at end of leak-detection cable run)

Observe the following guidelines and precautions when installing the leak-detection cable:

- Do not use conductive materials, such as Fire Block or caulk, on the leak-detection cable.
- Do not use any type of adhesive tape to secure the leak-detection cable.
- Do not use a leak-detection cable that is damaged or dirty for example, from plaster, spackle or debris.
- Do not drag the leak-detection cable through contaminants, such as dirt or grease.
- The floor must be clean for proper leak detection and for the hold-down clips to adhere. Use isopropyl alcohol to clean the spots on the floor for the hold-down clips.

- Use careful consideration to keep the leak-detection cable's route from the direct path of discharge air flow from air-conditioning or environmental equipment. If the cable is too close to the air stream, moisture from the discharge may cause false leak readings. Route the cable at least 6 ft (1.8 m) from discharge air flow to avoid nuisance alarms.
- Do not allow soldering or welding near the leak-detection cable without providing protection from heat and contamination. Also, avoid installing the cable near these types of areas.
- The clip's adhesive backing does not work well on porous concrete floors. We recommend using a drop of silicone or another non-conductive adhesive to help secure the clip to the floor.

NOTE: If the leak-detection cable does become dirty or contaminated, refer to Troubleshooting on page 73 for steps to clean the cable.

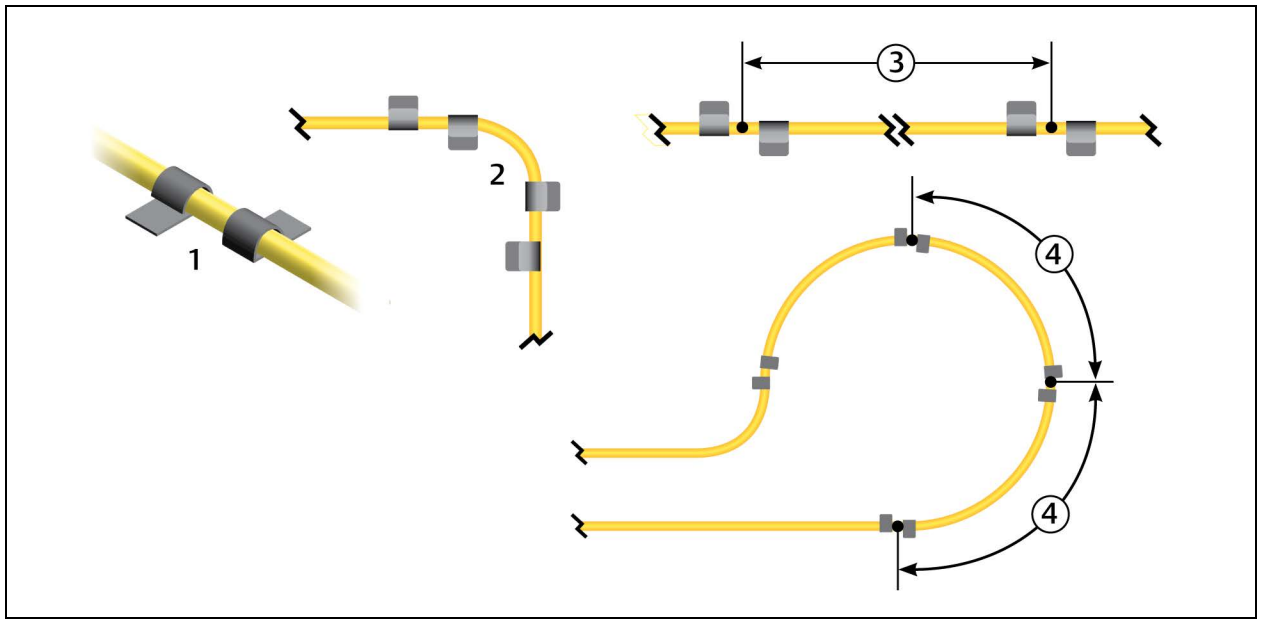
To install the cable:

1. Prepare the surface on which the leak-detection cable will be installed to avoid contaminating the cable. Clean the entire floor as much as possible.
2. Lay the cable in the pattern and route depicted in the layout diagram, maintaining consistent, uniform contact between the leak-detection cable and the floor.

3. Before inserting the cable in the clips, install the hold-down clips in pairs along the route as shown in the following figure.

CAUTION: Do not allow the adhesive used on the hold-down clips to come in contact with the leak-detection cable.

Figure 2.3 Hold-Down Clip Installation



Item	Description
1	Install clips in pairs.
2	On a 90-degree turn, install 1 pair at the beginning of the arc and 1 pair at the end of the arc.
3	On straight sections, install 1 pair every 6 to 8 ft (1.8 to 2.4 m).
4	In a circular pattern, install 1 pair every 3 to 4 ft (0.9 to 1.2 m).

4. Allow the adhesive for the hold-down clips to dry completely, then snap the cable into each clip.
5. Make sure that there are no gaps between the floor and the cable, adding clips as needed.
6. If necessary, make adjustments to the cable-layout diagram to represent the cabling "as-installed." This diagram will be used to measure and map leak-detection landmarks when testing the installation.

You are ready to connect the leak-detection cable to the controller. See Connecting the Leak-Detection Cable on the next page .

2.4 Connecting the Leak-Detection Cable

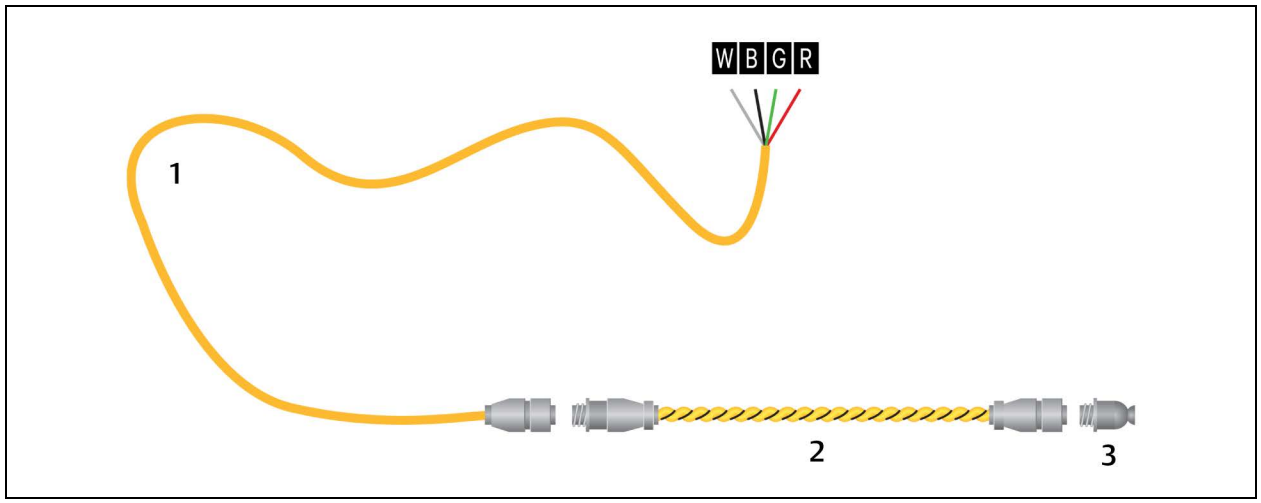
The leak-detection cable does not directly connect to the LP6000 controller. The 15-ft connection cable included with the system connects the controller to the leak-detection cable.

To connect the leak-detection cable to the controller:

1. With the screws of TB2 facing up on the controller, connect the 4, stripped, bare wires of the connector cable to the terminal block in the following order as shown in the following figure.
   - White
   - Black
   - Green
   - Red

NOTE: If the cable is removed from the terminal connector, make sure that the wires remain in the listed order when the connector is re-installed.

Figure 2.4 Connector Cable and Leak-Detection Cable Connection to Controller



Item	Description
1	Connector cable (CONNECT 15)
2	Leak-detection cable
3	End terminator (LT500-ET)

2. At the other end of the connector cable, unscrew the end terminator, and attach the male connector of the leak-detection cable to the connector cable as shown in the figure above.
3. Attach the end terminator to the end of the cable run and to the end of each branch-connector branch.

NOTE: A cable fault will register on the controller display if the end terminator is not attached.

You are now ready to connect power to the controller. See Connecting Power to Vertiv™ Liebert® Liqui-tect™ on the facing page .

2.5 Connecting Power to Vertiv™ Liebert® Liqui-tect™

WARNING! Liebert® Liqui-tect™ LP6000 requires a dedicated circuit breaker that is clearly marked as the disconnection device for the LP6000 controller. Make sure that the dedicated circuit break is off before connecting the AC power wires to the LP6000 controller. Follow all state and local codes.

1. Engage a certified electrician to run an isolated power supply to the location of the unit.
2. Remove knockouts, as necessary, from the bottom of the unit, then route the power supply into the enclosure to the power-input terminal block, and insert the wires a shown on the back plate: Neutral - Line - Ground, see Input and Output Connectors on page 6 .
3. Before applying power to the unit, make sure that all connections are correct and all screw terminals are secure.
4. Apply power and wait approximately 1 minute for the LP6000 to start up.
   There may be alarms because the leak-detection cable is not yet connected.
5. Verify that power is connected, and verify that the leak-detection cable is working by touching it with a clean, moist cloth or paper towel.
   If the cable is properly connected, an audible alarm sounds and an alarm notification displays on the digital display.

NOTE: Do not saturate the leak-detection cable for testing. A small amount of water triggers an alarm, and the cable must dry for the alarm to clear.

6. Dry the cable to remove the alarm condition. Use a hair dryer to speed up drying if needed.
7. Once you verify that the leak-detection cable is working, you are ready to calibrate the cable, map leak-detection points and test the installation. See Mapping and Testing the Installation on the next page .

2.6 Calibrating Resistance to Cable Length

The leak-detection cable has a base resistance of 4 ohms/ft. Because of manufacturing variances, the base resistance of each length of leak-detection cable may be slightly more or less than 4 ohms/ft, which means that the displayed length may be slightly more or less than the actual length of the cable.

While a configuration using base resistance values is very accurate, you can fine-tune the resistance to make it more precise to increase accuracy and bring the reported cable-length value in line with the actual cable length.

To calibrate cable resistance:

1. Make sure that the LP6000 controller is powered-on, has all sensing cables attached, and that there are no alarms.
2. Record the following data from the home page of the web UI:

Data	Recorded info
Cable length reported by LP6000.	
Cable current	
Leg 1 resistance	
Leg 2 resistance	

3. Select *Configuration* > *Leak Settings*, and record the following from the Leak Configuration page:

Data	Recorded info
Reported resistance per foot	

4. To calculate the actual length of the cable: Add the physical length of the cable (the sum of all of the lengths of installed cable) to the simulated length (the sum of all weighted lengths and branch connectors installed), refer to the following simulated lengths when determining the total simulated length.
   - LT500-WL simulates 35 ft
   - LT500-BC simulates 105 ft
   - Jumper cable adds 0 (zero) ft

   Calculate the actual length (physical length + simulated length) and record the result.

Data	Recorded info
Calculated actual length of cable	

5. Verify that the Cable Current recorded is less than 15 µA.
   - If the reading is higher than 15 µA, clean the cable using isopropyl alcohol to remove any contamination from installation.
6. Calculate the most-accurate resistance value by dividing the reported cable length by the actual cable length and multiplying the quotient by the reported resistance.

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

7. On the Leak Settings page, enter the newly-calculated resistance-per-foot value and click *Submit Changes*. The reported cable length now more-closely matches the physical length of the cable and thereby improves leak-detected reporting accuracy.

2.7 Mapping and Testing the Installation

NOTE: If the LP6000 controller is already to connected to a BMS or NMS, notify monitoring personnel before beginning the test.

1. On the "as-installed" cable-layout diagram prepared after laying the leak-detection cable:
   - Mark the cable routing, connection points, equipment used in and monitored by the Vertiv™ Liebert® Liqui-tect™ system.
   - Mark the locations where leak detection is critical and the locations at which the leak-detection cable changes directions. These will be the locations measured and mapped during testing.
2. Before beginning, set the leak alarm delay to 5 seconds as follows:
   - On the web interface, click *Configuration* > *Leak Settings*.
     Leak Settings on page 30 opens.
   - In Leak Alarm Delay, enter 5, then click *Submit Changes*.
3. At each marked location on the diagram, use one of the following methods to simulate a leak, and record the reported distance on the diagram:
   - 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 and wrap it loosely around the cable without putting pressure on the cable.

NOTE: To avoid inaccurate readings, do not grip the cable with your hand.

NOTE: Dry the cable to remove the leak alarm.

4. Verify that the simulated leaks are reported within a few feet of their actual, physical location based on the diagram.

NOTE: To fine tune the location of leak detections, see Calibrating Resistance to Cable Length on page 11 .

5. When finished, remove the source of simulated leaks, reset the leak alarm delay, and return the system to normal operation.

You are ready to configure communication to the web user interface. See Initial System Communication Set Up on page 15 .

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3 Initial System Communication Set Up

Once the LP6000 controller and leak-detection cable are installed and tested, configure communication with the web UI.

3.1 Configuring Network Communication Settings

NOTE: Consult your IT administrator before configuring communication. If you intend to change the IP Address or Subnet Mask, obtain appropriate addresses from your IT department.

The default addresses for LP6000 are:

- Default IP address: 169.254.24.7
- Default subnet mask: 255.255.0.0

To configure network communication:

Refer to Using the LCD Touch Screen on page 17 for descriptions of the screens.

1. On the display, touch *Setup*.
   A password prompt opens.
2. Initially, there is no password to access set up, touch the enter key.
   The Setup menu opens.
3. Use the Up/Down buttons to highlight System Settings and touch *Select*.
   The System Setup menu opens.
4. Use the Up/Down buttons to highlight the IP address and touch *Select* to change it.
5. Use the backspace button to delete the default address, and enter the values provided by the IT administrator, then press the enter button to apply the change.
6. Repeat Steps 4 and 5 for the Net Mask (subnet mask), and Def Route (default gateway) as necessary.
7. Verify that the change is successful, open a web browser and enter the new IP address entered for Vertiv™ Liebert® Liqui-tect™, then enter the default user name and password.
   The home page opens.

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4 Using the LCD Touch Screen

The LP6000 touch screen provides quick access to alarm information, acknowledge alarms and system status. It also accesses many configuration settings and operations. Although the web user interface (UI) offers more in-depth functions and settings, all of the options available and edited via the touch screen propagate to the web UI.

4.1 LP6000 Main LCD Screen

The main screen displays system information, including current alarm status, detected leak status, visual alarm notification, and options to silence, view detail, view status, and configure set up.

NOTE: When navigating through the screens, the Return button takes you back to the previous screen.

NOTE: After 5 minutes of inactivity on any screen, the display returns to the main screen.

The main screen offers the following options:

- Silencing an Audible Alarm below
- Alarms List below shows current alarms and alarm history where you can acknowledge alarms
- Controller Status on the next page shows current system status and settings
- Setup and Configuration on the Touchscreen on page 21

4.2 Silencing an Audible Alarm

- On the LCD main screen, touch *Silence*.
  The audible notification is silenced.

4.3 Alarms List

Touch the *Alarms* button on the main screen to display a list of current alarms. On the alarms screen, you can access the history of alarms and acknowledge alarms, see Alarm History on the next page and Acknowledging Alarms on the Touchscreen on the next page .

- Touch *Return* to go back to the main screen.

The displayed alarms are color coded to indicate their status, described in Current Alarm Color Codes below .

Table 4.1 Current Alarm Color Codes

Color	Description
Red	Active leak-detection alarm.
Yellow	Active contamination or cable-break alarm.
Orange	Active communication-problem alarm. Typically indicates that a secondary device is offline.

4.4 Alarm History

The alarm history contains the last 1,024 alarm events.

To view the alarm history:

1. On the main display, touch *Alarms*.
   The Alarm list opens.
2. Touch *History*.
   The Alarm History opens.
   - Use Next and Previous to page through the history list.
   - Use Return to go back to the current alarm list.
   - Use Ack to acknowledge alarms, see Acknowledging Alarms on the Touchscreen below .

The alarm-history events are color-coded as described in Alarm History Color Codes below .

Table 4.2 Alarm History Color Codes

Color	Description
Red	unacknowledged alarm.
Blue	Acknowledged alarm.
Black	Alarm condition is resolved or additional functional information is provided.

4.4.1 Acknowledging Alarms on the Touchscreen

To acknowledge all unacknowledged alarms:

1. On the main display, touch *Alarms*.
   The Alarm list opens.
2. Touch *History*.
   The Alarm History opens.
3. Touch *Ack*.
   All alarms are acknowledged and color changes from red to blue.

4.5 Controller Status

The Status screen shows current system status and leak-detection settings. The screen is view-only, and most items may be adjusted using the System options, see Setup and Configuration on the Touchscreen on page 21 . You can view network, communication, and trends from this screen, see System Status Options on the facing page .

To view the controller status:

- On the main display, touch *Status*.
  The Status screen opens.
  - Use System to view additional status information, see System Status Options on the facing page .
  - Use Return to go back to the main screen.

Table 4.3 LCD Controller Status Fields

Field	Description
Alarm Status	Details of alarm, if an alarm is present. The field changes color depending on type of alarm.
Cable Length	Calculated length of the connected leak-detection cable. See Calibrating Resistance to Cable Length on page 11 for a description of how LP6000 calculates the length.
Cable current	Amount of current running through the leak-detection cable.
Leg 1 Resistance	Resistance, in Ohms, of Leg 1.
Leg 2 Resistance	Resistance, in Ohms, of Leg 2
Leak Alarm Delay	Time delay, in seconds, that passes between leak detection and alarm notification.
Contamination Alarm Delay	Time delay, in seconds, that passes between contamination detection and alarm notification.
Re-alarm Countdown	Time remaining before an alarm is re-annunciated.
Last Alarm Time	Time the last alarm notification occurred.
sysUp Time	Time passed since system was reset or powered-on.

4.5.1 System Status Options

The System Status screen shows the Vertiv™ Liebert® Liqui-tect™ model number, firmware version, network address, and other system statistics. The screen is view-only, and most items may be adjusted using the System options, see Setup and Configuration on the Touchscreen on page 21 .

To view system status and statistics:

1. On the main display, touch *Status*.
   The Status screen opens.
2. Touch *System*.
   The System Status screen opens. The buttons offer the following options:
   - Viewing Network Statistics below
   - Viewing EIA-485 Connection Statistics on the next page
   - Viewing the Trend Log on the next page
   - Use Return to go back to the Status screen.

4.5.2 Viewing Network Statistics

The screen is view-only, and most items may be adjusted using the System options, see Setup and Configuration on the Touchscreen on page 21 .

1. On the main display, touch *Status*.
   The Status screen opens.
2. Touch *System*.
   The System Status screen opens.
3. Touch *Network*.
   The Network Statistics open. The buttons offer the following options:
   - Use Reset to reset all monitored items to zero.
   - Use Return to go back to the Status screen.

4.5.3 Viewing EIA-485 Connection Statistics

The screen is view-only, and most items may be adjusted using the System options, see Setup and Configuration on the Touchscreen on the facing page .

1. On the main display, touch *Status*.
   The Status screen opens.
2. Touch *System*.
   The System Status screen opens.
3. Touch *EIA-485*.
   The EIA-485 Statistics open. The buttons offer the following options:
   - Use Reset to reset all monitored items to zero.
   - Use Return to go back to the Status screen.

4.5.4 Viewing the Trend Log

1. On the main display, touch *Status*.
   The Status screen opens.
2. Touch *System*.
   The System Status screen opens.
3. Touch *Trend*.
   The Trend Log opens.
   - Use Next and Previous to page through the log.
   - Use Return to go back to the Status screen.

4.6 Setup and Configuration on the Touchscreen

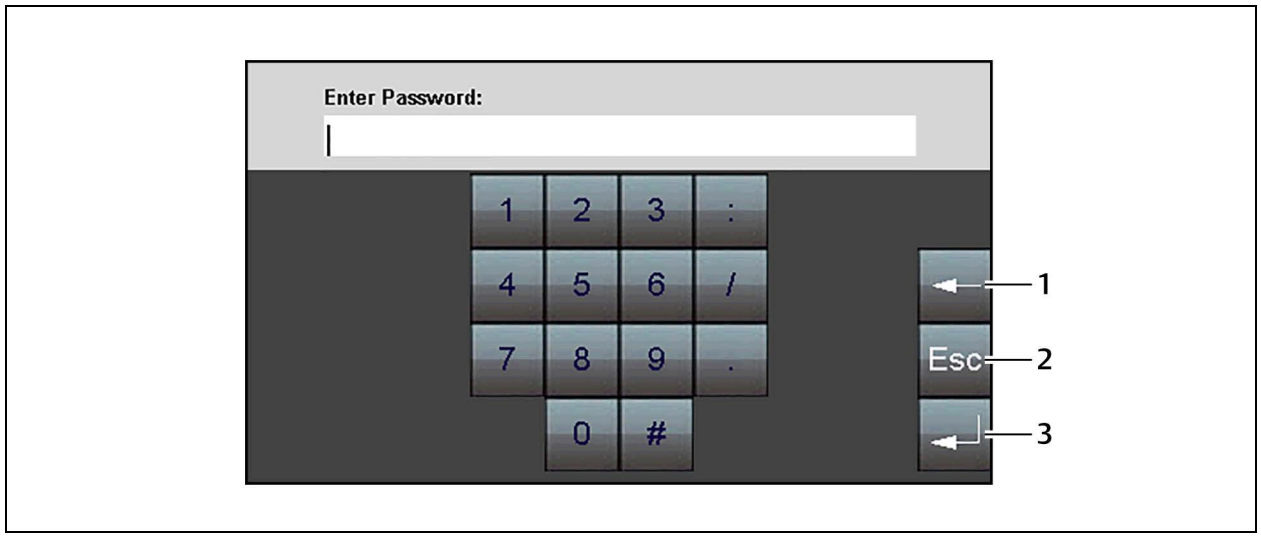
The Setup Menu provide options to configure most leak-detection and system settings. All of the options available and edited via the touch screen propagate to the web interface.

To access the Setup menu:

1. On the LCD display, touch *Setup*.
   The Enter Password dialog opens.

NOTE: The Setup menu may be password protected. By default, there is no password, but the password screen always opens. Leave the field blank and touch the enter key to open the menu. To set a password, see Configuring Leak Settings on the Touchscreen on the next page .

Figure 4.1 LCD Password Dialog



Item	Description
1	Backspace
2	Escape, returns to the previous screen without saving.
3	Enter, accepts entry/saves changes.

2. Enter a password and touch the enter key.
   The Setup menu opens providing access to the following options:
   - Configuring Leak Settings on the Touchscreen on the next page
   - Configuring Virtual Zone Settings on the Touchscreen on page 23
   - Configuring Secondary Zones on the Touchscreen on page 24
   - Configuring 4-20 mA Output on the Touchscreen on page 25
   - Setting a Maintenance Reminder on the Touchscreen on page 25
   - Configuring Network and System Settings on the Touchscreen on page 26
   - Configuring EIA-485 and Modbus Port Communication on the Touchscreen on page 26
   - Configuring BACnet Communication on the Touchscreen on page 27
   - Clearing Alarm History and Trend Logs on the Touchscreen on page 28

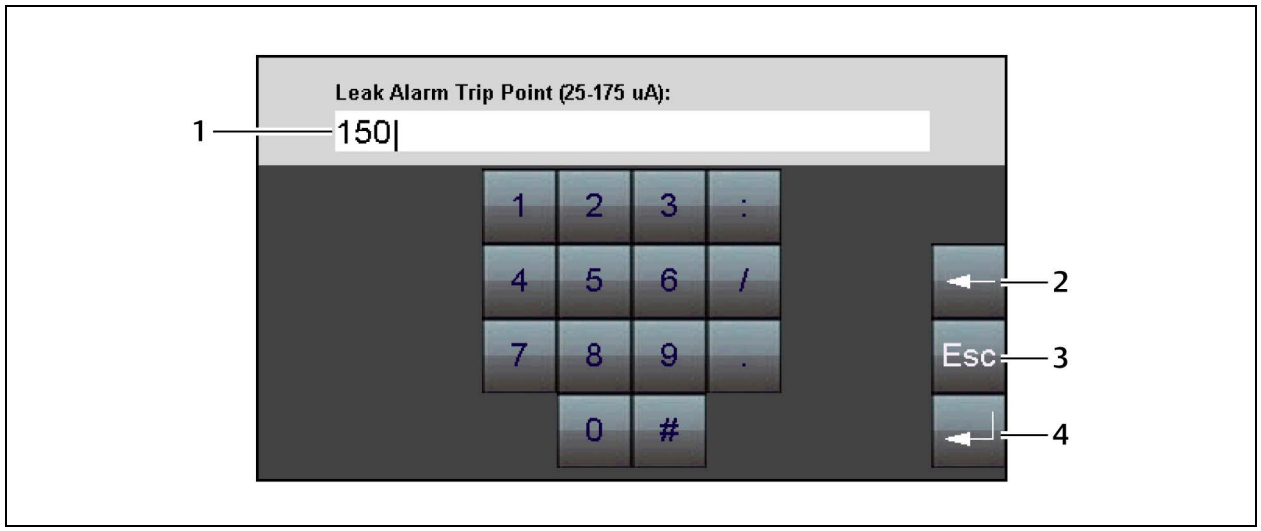
4.6.1 Using the Keyboard and Selecting Settings

When settings are selected for configuration, a selection screen or keyboard opens.

The keyboard displays the configuration setting as shown in the following figure. Use the keyboard to enter the setting.

NOTE: For some settings, the configuration is selectable. Use the Up/Down buttons to highlight the setting, then touch *Select*.

Figure 4.2 Keyboard



Item	Description
1	Configuration setting
2	Backspace, deletes the entry.
3	Escape, returns to the previous screen without saving.
4	Enter, accepts entry/saves changes.

4.6.2 Configuring Leak Settings on the Touchscreen

The Leak Settings configure system variables including leak and contamination thresholds, latching and un-latching alarms, and leak-detection cable resistance.

To access leak settings:

1. On the LCD display, touch *Setup*, enter a password if needed, and touch the enter key.
   The Setup menu opens.
2. Touch *Up*/*Down* to highlight Leak Settings, and touch *Select*.
   The Leak Settings menu opens.
3. Touch *Up*/*Down* to highlight the setting to configure (described in the following table), and touch *Select*.
   See Using the Keyboard and Selecting Settings above to update the setting.

Table 4.4 LCD Leak Settings Options

Field	Description
Leak Trip Point	Threshold for amount of water to trigger a leak-detection alarm. Sets the sensitivity of the alarm. A lower number equals greater sensitivity, which triggers an alarm with less water. A higher number equals less sensitivity, requiring more water to trigger an alarm. Default: 150 µA.
Contamination Trip Point	Threshold for amount of contamination to trigger a contamination alarm. Sets the sensitivity of the alarm. A lower number equals greater sensitivity, which triggers an alarm with less contamination. A higher number equals less sensitivity, requiring more contamination to trigger an alarm. Default: 50 µA.
Leak Alarm Delay	Time delay between leak detection and alarm notification. The leak must be detected during the entire delay to trip the alarm. Default: 20 seconds.
Contamination Alarm Delay	Time delay between contamination detection and alarm notification. The contamination must be detected during the entire delay to trip the alarm. Default: 120 seconds.
Resistance Per Foot	Sets accuracy of distance-to-leak reporting. The resistance per foot (meter) determines the ability to detect cable length and distance to leaks. Must be a 4-digit number formatted: x.xxx. For further information on resistance and accuracy, see Calibrating Resistance to Cable Length on page 11. Default: 4.000 ohm.
Re-Alarm Delay	Defines interval at which notification for an un-resolved alarm condition is re-sent. Zero (0) disables re-send, sending a single notification. Default: 0 (disabled).
Measurement Display	Selects unit of measure for system/display. Default: feet.
Latching Alarms	Selects automatic alarm reset or manual alarm reset. • Yes = Latching—alarm must be reset manually even if alarm condition is resolved. • No = Non-latching—alarm resets automatically when leak or contamination is resolved. Default: No.
Audible Alarm	Enables/Disables audible alarm notification. Default: No = disabled.
LCD Password	4-digit, numeric password to access the Setup menu. Default: 0000 = no password.

4.6.3 Configuring Virtual Zone Settings on the Touchscreen

The Virtual Zone Settings menu defines the virtual zones in your installation.

To access virtual-zone settings:

1. On the LCD display, touch *Setup*, enter a password if needed, and touch the enter key.
   The Setup menu opens.
2. Touch *Up*/*Down* to highlight Virtual Zone, and touch *Select*.
   The Virtual Zone Settings menu opens.

3. Touch *Up*/*Down* to highlight the setting to configure (described in the following table), and touch *Select*. The keyboard opens.
4. Use the backspace button to delete the old entry, enter the settings and touch the enter key.
   - To delete a zone, delete the text from all fields.

Table 4.5 LCD Virtual Zone Fields

Field	Description
Zone #	Number designating a zone.
Label	Descriptive label for the zone displayed in notifications and event logs. 30-character limit.
End Distance	Distance on the leak-detection cable at the end of the zone. Zone #1 always starts at 0 (zero), and the end of the zone is designated by distance from start. The each subsequent zone starts at the End Distance of the previous zone.

4.6.4 Configuring Secondary Zones on the Touchscreen

If secondary controllers are connected to the LP6000, use Secondary Zones to configure control of the secondary devices.

To configure secondary zones:

1. On the LCD display, touch *Setup*, enter a password if needed, and touch the enter key. The Setup menu opens.
2. Touch *Up*/*Down* to highlight Secondary Zone, and touch *Select*. The Secondary Zone Settings menu opens.
3. Touch *Up*/*Down* to highlight the zone to configure, and touch *Select*. The Secondary Zone Setup menu opens.
4. Touch *Up*/*Down* to highlight the setting to configure (described in the following table), and touch *Select*. See Using the Keyboard and Selecting Settings on page 22 to update the setting.

Table 4.6 LCD Secondary Zone Setup Fields

Field	Description
Secondary Zone #	Number designating the zone. Read-only.
Label	Descriptive label for the zone. Displayed in notifications and event logs. 30-character limit.
Controller Type	Type of secondary device. Options are: • Distance Read
Comm Type	Type of communication used by unit. Depends on the type of connection used: • When using the EIA-485 port, select RS-485 port 1, RS-485 port 2, or RS-485 port 3. • When using the Ethernet port, select Modbus/TCP, Modbus/UDP, or Bacnet IP depending on the type of communication used by the device.
Serial Address/Secondary ID	When using EIA-485 port, sets the serial address for secondary devices. When using Ethernet port/Modbus communication, sets the secondary-ID address for secondary devices. In both cases, the number must match the address/ID assigned to the device for EIA-485 Port/Modbus communication, and it must match the zone number.
IP Address	For Ethernet port communication, sets the IP address for the secondary devices.
V-Zone	Descriptive label for virtual zones of the secondary controller. • The zone name and distance values are editable for devices communicating via Modbus. • The zone information is read-only for devices communicating via BACnet.

4.6.5 Configuring 4-20 mA Output on the Touchscreen

The 4-20 mA output only reports up to 5,000 ft of leak-detection cable.

1. On the LCD display, touch *Setup*, enter a password if needed, and touch the enter key.
   The Setup menu opens.
2. Touch *Up*/*Down* to highlight 4-20 mA Output, and touch *Select*.
   The 4-20 mA Output Settings menu opens.
3. Touch *Up*/*Down* to highlight the setting to configure (described in the following table), and touch *Select*.
   See Using the Keyboard and Selecting Settings on page 22 to update the setting.

Table 4.7 LCD 4-20 mA Output Settings Fields

Field	Description
Leak Alarm Output Span	Span over which leak alarms are output. Options are: • 5-19 mA • 4-20 mA Default: 5-19 mA.
Leak Alarm Output Range	Range of leak alarm output. Options are: • 1000 • 2500 • 5000 Default: 1000.

4.6.6 Setting a Maintenance Reminder on the Touchscreen

The Preventative Maintenance menu lets you set-up a recurring reminder alarm.

To configure the preventative maintenance reminder:

1. On the LCD display, touch *Setup*, enter a password if needed, and touch the enter key.
   The Setup menu opens.
2. Touch *Up*/*Down* to highlight Preventative Maintenance, and touch *Select*.
   The Preventative Maintenance menu opens.
3. Touch *Up*/*Down* to highlight the setting to configure (described in the following table), and touch *Select*.
   See Using the Keyboard and Selecting Settings on page 22 to update the setting.

Table 4.8 LCD Preventative Maintenance Fields

Field	Description
PM Alarm Every	Number of days to elapse between maintenance-reminder alarms. Range is 30 to 720 days and 0 (zero) disables the alarm. Default: 0 (disabled).
LCD Acknowledge Code	Sets a 4-digit, numeric code to acknowledge the maintenance-reminder alarm. Four zeros (0000) disables the acknowledgment code. Default: 0000 (disabled).
Text	Text displayed with alarm. 4 lines of text with a 30-character-per-line limit.

4.6.7 Configuring Network and System Settings on the Touchscreen

The system settings menu provides options to set a system name, the date and time, and to configure the network communication options. It also displays the device's MAC address.

CAUTION: Incorrect network settings will make the web UI inaccessible. Consult with your IT/network administrator before making any changes.

To configure network and system settings:

1. On the LCD display, touch *Setup*, enter a password if needed, and touch the enter key.
   The Setup menu opens.
2. Touch *Up*/*Down* to highlight System Settings, and touch *Select*.
   The System Setup menu opens.
3. Touch *Up*/*Down* to highlight the setting to configure (described in the following table), and touch *Select*.
   The keyboard opens.
4. Use the backspace button to delete the old entry, enter the setting and touch the enter key.

Table 4.9 LCD Network and System Set Up Fields

Field	Description
System Name	Unique name for the Liebert® Liqui-tect™ controller. 30-character limit.
Date	Current date in mm/dd/yy format.
Time	Current time in hh:mm:ss format.
IP Address	Sets the IP address of the Liebert® Liqui-tect™ controller. Default: 169.254.24.7.
Def route	Designates the default gateway of the device.
Net Mask	Sets the subnet address of the Liebert® Liqui-tect™ controller. Default: 255.255.255.0.
MAC Address	Display-only, unique identifier set by device manufacturer.

4.6.8 Configuring EIA-485 and Modbus Port Communication on the Touchscreen

When using the LP6000 controller as a Modbus "primary," use this port-configuration page to set up communication with the secondary devices through the EIA-485 or Ethernet ports. See Configuring the Controller as a Modbus Primary on page 42 for the detailed setup steps.

To configure EIA-485 and Modbus Port settings:

1. On the LCD display, touch *Setup*, enter a password if needed, and touch the enter key.
   The Setup menu opens.
2. Touch *Up*/*Down* to highlight EIA-485 / Modbus / N2, and touch *Select*.
   The EIA-485 / Modbus / N2 Setup menu opens.
3. Touch *Up*/*Down* to highlight the setting to configure (described in the following table), and touch *Select*.
   See Using the Keyboard and Selecting Settings on page 22 to update the setting.

Table 4.10 LCD EIA-485 and Modbus Setup Fields

Field	Description
TCP/UDP UID	If using the Ethernet port for a primary/secondary setup, selects the secondary-unit number designation for the device from 1 to 254. 0 (zero) disables the option.
Alarm Relay	Enable/Disable alarm relay.
EIA-485 Port 1	Selects the function of the EIA-485 port for the LP6000 controller. Options are: • Modbus-Secondary • Modbus-Primary See Configuring the Controller as a Modbus Primary on page 42 .
Port 1 Baud Rate	Selects the baud rate for the port. Options are: • 9600 • 19200 • 38400
Port 1 Secondary Address	Selects the secondary address for the port from 1-254. 0 (zero) disables the option.
EIA-485 Port 2	Selects the function of the EIA-485 port for the LP6000 controller. Options are: • Modbus-Secondary • Modbus-Primary • Bacnet-MS/TP-Secondary (only available on port 2) See Configuring the Controller as a Modbus Primary on page 42 .
Port 2 Baud Rate	Selects the baud rate for the port. Options are: • 9600 • 19200 • 38400
Port 2 Secondary Address	Selects the secondary address for the port from 1-254. 0 (zero) disables the option.
EIA-485 Port 3	Selects the function of the EIA-485 port for the LP6000 controller. Options are: • Modbus-Secondary • Modbus-Primary See Configuring the Controller as a Modbus Primary on page 42 .
Port 3 Baud Rate	Selects the baud rate for the port. Options are: • 9600 • 19200 • 38400
Port 3 Secondary Address	Selects the secondary address for the port from 1-254. 0 (zero) disables the option.

4.6.9 Configuring BACnet Communication on the Touchscreen

Use the BACnet page configure control and monitoring of LP6000 by a building-management system (BMS).

To configure BACnet settings:

1. On the LCD display, touch *Setup*, enter a password if needed, and touch the enter key.
   The Setup menu opens.
2. Touch *Up*/*Down* to highlight Bacnet, and touch *Select*.
   The Bacnet Setup menu opens.

3. Touch *Up*/*Down* to highlight the setting to configure (described in the following table), and touch *Select*. The keyboard opens.
4. Use the backspace button to delete the old entry, enter the setting and touch the enter key.

Table 4.11 LCD BACnet Setup Fields

Field	Description
Device Name	Unique name for the LP6000 controller. 30-character limit.
Device ID	Device ID number for the LP6000. 30-character limit. 0 (zero) = disabled.
Description	Description of the LP6000 device. 30-character limit.
UDP Port	Specifies UDP port used by the application. Enter 0 (zero) to specify port 47808 (0xBAC0) as the UPD port. If your application specifies a different port, enter that value here. Default: 0
MS/TP Max Primary	Sets the secondary address. Valid values: 1 to 127. 0 (zero) = secondary-only. Default: 0

4.6.10 Clearing Alarm History and Trend Logs on the Touchscreen

1. On the LCD display, touch *Setup*, enter a password if needed, and touch the enter key. The Setup menu opens.
2. Touch *Up*/*Down* to highlight Clear History, and touch *Select*.
3. Use the Up/Down buttons to highlight Yes, and touch *Select*. The alarm history and trend logs are cleared.

5 Using the Web Interface

Use the Vertiv™ Liebert® Liqui-tect™ web user interface (UI) to configure leak-detection and to monitor system status.

NOTE: The default IP address for the LP6000 controller is 169.254.24.7. This may have been changed. If the address has been changed, use the following steps to get the IP address for the web interface.

Verify the IP address in use:

- See Viewing Network Statistics on page 19 to verify the IP address.

To log-in to the web UI:

1. Open a web browser, and enter the LP6000 controller's IP address in the address bar.
   The authentication dialog opens.
2. Enter a User Name and Password, and click *Log In*.
   The default user name and password are as follows. This may have been changed. Contact your Liebert® Liqui-tect™ system administrator for the assigned user name and password.
   - Default user name: Liebert (case sensitive)
   - Default password:

     Read-only access: There is no default password, leave the field blank.

     Read/Write access: Liebert (case sensitive)

   The web UI opens to the Vertiv™ Liebert® Liqui-tect™ Home Page below .

5.1 Vertiv™ Liebert® Liqui-tect™ Home Page

The home page displays system information, including current alarm status, the reported length of the connected leak-detection cable, the last time an alarm activated, and the running system up-time. The image can be linked to interactive floor maps.

- To access the home page, click *Home* on the menu bar.

Table 5.1 Liebert® Liqui-tect™ Home Page Fields

Field	Description
Alarm Status	Details of alarm, if an alarm is present. The field changes color depending on type of alarm.
Cable Length	Calculated length of the connected leak-detection cable. See Calibrating Resistance to Cable Length on page 11 for a description of how Liebert® Liqui-tect™ calculates the length.
Cable current	Amount of current running through the leak-detection cable.
Leg 1 Resistance	Resistance, in Ohms, of Leg 1.
Leg 2 Resistance	Resistance, in Ohms, of Leg 2
Leak Alarm Delay Count	Time delay, in seconds, that passes between leak detection and alarm notification.
Contamination Alarm Delay Count	Time delay, in seconds, that passes between contamination detection and alarm notification.
Re-alarm Countdown	Time remaining before an alarm is re-annunciated.
Last Alarm Time	Time the last alarm notification occurred.
sysUp Time	Time passed since system was reset or powered-on.

5.2 Identity Page

The Identity page displays the Vertiv™ Liebert® Liqui-tect™ model and system information. This page is a reference screen, and any adjustments are made using the Configuration Menu below .

5.3 Configuration Menu

The Configuration Menu page lists options to adjust Vertiv™ Liebert® Liqui-tect™ system settings.

NOTE: When editing any configuration items, be sure to click *Submit Changes* to save the changes. If you navigate from the page without submitting, the changes are lost.

The configuration options are:

5.3.1 Leak Settings

The Leak Settings page configures system variables including leak and contamination thresholds, latching and un-latching alarms, and leak-detection cable resistance.

Table 5.2 Leak Settings Fields and Options

Field	Description
Leak Trip Point	Threshold for amount of water to trigger a leak-detection alarm. Sets the sensitivity of the alarm. A lower number equals greater sensitivity, which triggers an alarm with less water. A higher number equals less sensitivity, requiring more water to trigger an alarm. Default: 150 µA.
Contamination Trip Point	Threshold for amount of contamination to trigger a contamination alarm. Sets the sensitivity of the alarm. A lower number equals greater sensitivity, which triggers an alarm with less contamination. A higher number equals less sensitivity, requiring more contamination to trigger an alarm. Default: 50 µA.
Leak Alarm Delay	Time delay between leak detection and alarm notification. The leak must be detected during the entire delay to trip the alarm. Default: 20 seconds.
Contamination Alarm Delay	Time delay between contamination detection and alarm notification. The contamination must be detected during the entire delay to trip the alarm. Default: 120 seconds.
Resistance Per Foot	Sets accuracy of distance-to-leak reporting. The resistance per foot (meter) determines the ability to detect cable length and distance to leaks. Must be a 4-digit number formatted: x.xxx. For further information on resistance and accuracy, see Calibrating Resistance to Cable Length on page 11. Default: 4.000 ohm.
Re-Alarm Interval	Defines interval at which notification for an un-resolved alarm condition is re-sent. Zero (0) disables re-send, sending a single notification. Default: 0 (disabled).
Measurement Display	Selects unit of measure for system/display. Default: feet.
Latching Alarm	Selects automatic alarm reset or manual alarm reset. • Yes = Latching—alarm must be reset manually even if alarm condition is resolved. • No = Non-latching—alarm resets automatically when leak or contamination is resolved. Default: No.
Audible Alarm	Enables/Disables audible alarm notification. Default: Enabled.
Length Calibration Factor	Display-only, factory-set calibration.
4-20mA Leak Alarm Output Span	Selects span of leak-alarm output.
4-20mA Leak Alarm Output Range	Selects range of leak-alarm output.
Preventative Maintenance Alarm	Selects number of days to elapse between maintenance alarms.
Preventative Maintenance LCD Ack Code	Sets a 4-digit, numeric code to enter to acknowledge the preventative-maintenance alarm. Zeros (0000) disable the acknowledgment code.
Preventative Maintenance Text	Text displayed for maintenance alarm notification. Up to 4 lines of text, 30 characters per line.
LCD Midnight Reset	
Set Cable Relay Button	Leak-detection cable simulation for troubleshooting the controller. See Troubleshooting Controller Using Set Cable Relay on the next page.

Troubleshooting Controller Using Set Cable Relay

Set Cable Relay simulates 8060 ohms of leak-detection cable for a period up to 5 minutes.

To test controller operation:

1. Click *Configuration* > *Leak Settings*.
   Leak Settings on page 30 opens.
2. Click *Set Cable Relay*, then click *Home*.
3. On the Vertiv™ Liebert® Liqui-tect™ Home Page, confirm proper function by verifying that the displayed values match those listed for the fields that follow:
   - Cable Length = approximately 2015 ft
   - Leg 1 Resistance = approximately 8060 ohms
   - Leg 2 Resistance = approximately 8060 ohms

5.3.2 Virtual Zone Settings

Virtual Zone Configuration defines the virtual zones in your installation.

Table 5.3 Virtual Zone Configuration Fields and Options

Field	Description
Zone #	Number designating a zone.
Label	Descriptive label for the zone displayed in notifications and event logs. 30-character limit.
End Distance	Distance on the leak-detection cable at the end of the zone. Zone #1 always starts at 0 (zero), and the end of zone 1 is designated by distance from start. The each subsequent zone starts at the End Distance of the previous zone.

5.3.3 Secondary Controller Settings

The LP6000 can act as a Modbus or BACnet IP primary for up to 127 Vertiv™ Liebert® Liqui-tect™ devices connected to the system. See Modbus Communication Protocol on page 55 , to configure the Liebert® Liqui-tect™ as a Modbus primary.

Table 5.4 Modbus/Secondary Controller/Zone Configuration Fields and Options

Field	Description
Controller	Number designating the controller.
Label	Descriptive label for the controller. 30-character limit.
Control Type	Selects the type of secondary device. Options are: • Distance Read
Enable Comm Type	Type of communication used by secondary device.
Address/Secondary ID/Device ID	Address for secondary devices.
IP Address	IP address for the secondary device.

5.3.4 Secondary Zone Settings

If secondary controllers are configured, use Secondary Zones to configure the zones for the secondary controllers.

NOTE: Label and configuration options depend on the type of device connected. Some fields may be read-only. If no secondary controllers are configured, selecting Secondary Zones re-directs you to the Configuration menu.

NOTE: Make sure that the correct secondary controller is selected. Use the *Jump to controller* drop-down at the top-right to change the secondary controller displayed.

Table 5.5 Secondary Controller Zone Configuration Fields and Options

Field	Description
Virtual Zone #	Number designating the zone.
Label	Descriptive label for the zone. 30-character limit.
End Distance	Distance on the leak-detection cable at the end of the zone. Zone #1 always starts at 0 (zero), and the end of the zone is designated by distance from start. The each subsequent zone starts at the End Distance of the previous zone.

5.3.5 Network/IP Settings

The Network Settings/IP Configuration page displays the device's MAC address and configures the network communication settings for the web UI.

CAUTION: Incorrect network settings will make the web UI inaccessible. Consult with your IT/network administrator before making any changes.

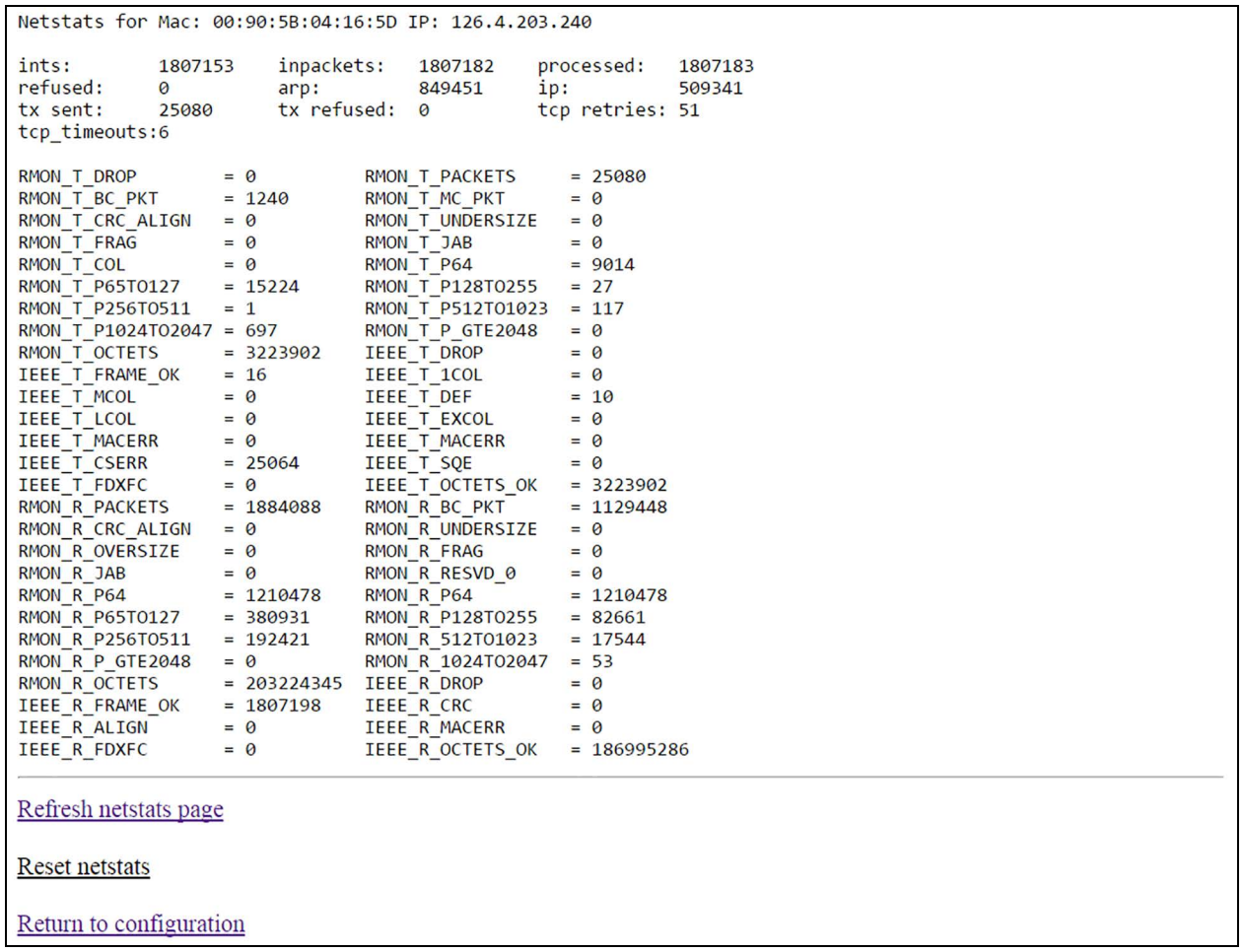
Table 5.6 IP Configuration Fields and Options

Field	Description
MAC Address	Display-only, unique identifier set by device manufacturer.
IP Address	Sets the IP address of the LP6000 controller. Default: 169.254.24.7.
Net Mask	Sets the subnet address of the LP6000 controller. Default: 255.255.0.0.
Def route	Designates the default gateway of the device.
Http Port	Alternate http port for use with ISPs security settings, if needed.
Tcp Max Seg Size	Selects packet size. • 1436 = packet size for web-page data. • 536 = packet size for limited bandwidth or VPN applications.
Disable Network Watchdog	Reboots device in the event of excess network traffic or detected errors.

5.3.6 Network Statistics

The Network Statistics page is a snapshot of the most-recent network information.

Figure 5.1 Network Statistics Page



5.3.7 Web Settings

The Web Configuration page provides several configuration and customization options:

- Customize the user name and password for the web UI.
- Customize the home page graphic.

Table 5.7 Web Configuration Fields and Options

Field	Description
Web Username	Sets user name to access web UI.
Web Password Read Only	Sets password for view-only access to web UI.
Web Password Read/Write	Sets password for view and edit access to web UI. Allows updates to Liebert® Liqui-tect™ configuration.
Web Refresh Rate	Sets frequency to check for new data and reload web page. Zero (0) disables automatic refresh.
Main Page Image	Selects an image or interactive map to display on home page. See Uploading Images.

5.3.8 Map Settings

The Map Configuration page uploads up to 10 facility maps that can be populated with leak-detection data for interactive leak-detection maps accessed from links on the home page. See Facility Reference Maps below .

Table 5.8 Map Configuration Fields and Options

Field	Description
Floor Map Link Text	Displayed text for the link.
Floor Map Interactive	Enables/Disables Interaction with the map. See Facility Reference Maps below to set up an interactive map.
Map Type	For map 1, selects the type of map. Options are: • Distance read = map overlay that plots points to display leak detection in a single zone. • Primary Zone Map = displays all configured zones on a single map and displays the alarm condition for the zones. Note: Map type is only available on map 1.
Primary Zone Map Links	Enables/Disables linking the zones on the primary-zone map to specific zone maps or the web UIs secondary devices. Options are: Disabled = links are disabled. Maps 2-10 = links to the other loaded maps for the zones. Secondary Web Page = links to the web UI of the secondary devices in the zones.
Zone/Controller	Designate the zone or seconary Liebert® Liqui-tect™ controller to which the map links. Zone/Controller 1 is reserved for a single or the primary Liebert® Liqui-tect™ controller.

Facility Reference Maps

You can upload up to 10 facility maps and add interactive leak-detection data to the maps for real-time leak-detection equipment location and status and for active-alarm location.

The mapping process creates an overlay for an uploaded map image based on coordinates designated using the Map Alarm links at the bottom of the Map Settings above .

NOTE: Do not attempt interactive mapping before the monitored area is completely installed and assembled and all leak-detection equipment is in place, tested and functional.

The file requirements for the uploaded map image are:

- File size: 500 kb or less
- Image dimension/size: 4000 x 4000 pixels or less
- File format: .png, .jpg or .gif

When the Vertiv™ Liebert® Liqui-tect™ system and facility map(s) are ready, see Uploading a Reference Map.

Uploading Reference Maps

1. Select *Configuration* > *Map*.
   Map Settings above opens.
2. In Jump to Map, select the map (1 to 10) to upload.
   If loading the primary-zone map, you must select map 1.
3. In Floor Map Link Text, enter a descriptive name for the link on the home page.
4. Select Yes for Floor Map Interactive, if you plan to add links/coordinates for an interactive map.

5. If loading the primary-zone map, select the appropriate options in Map Type and Primary Zone Map Links.
6. In Zone/Controller, enter the number of the zone/secondary controller represented by the map.
   The primary-zone map must be zone 1.
7. Click *Submit Changes*.

NOTE: Be sure to submit changes before uploading the image or all of your selections will be lost.

8. Click *Choose File* and browse to select the image file , then click *Upload*.
   The map is uploaded.
9. See Marking Interactive Reference Points on the Map below to add the interactive coordinates.

Marking Interactive Reference Points on the Map

After the map is uploaded, mark reference points to which you can refer when a leak is detected.

NOTE: The references are an overlay on the map image. If the map image needs minor adjustments, you do not need to reconfigure reference points if the replacement image is the same size (pixels x pixels) as the previous image and the layout does not change.

To mark reference points:

1. Select *Configuration* > *Map*, then click *Map Alarm Coordinates - Graphical*.
   An enlarged view of the map opens in the browser window.
2. Set the reference point for the beginning of the leak-detection cable:
   - In the Enter a distance field, enter 0 (zero).
   - On the map, click the beginning of the leak-detection cable.
     The distance and x-y coordinates are saved creating the reference point at the center of the cross hairs.
3. Continue entering distances and clicking points on the map for each reference point.

NOTE: We highly recommend that you enter a distance/point each time the leak-detection cable changes direction.

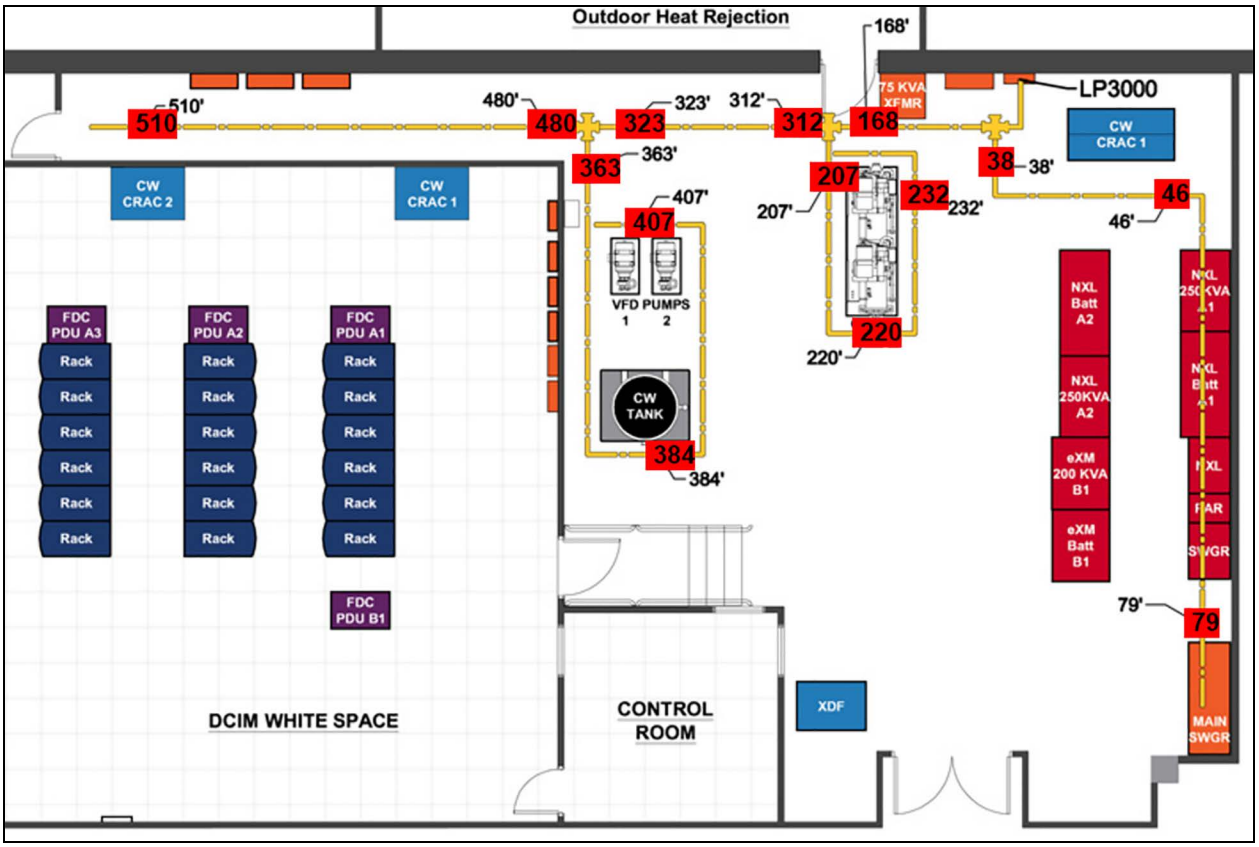
- To verify the reference points, see Testing Mapped Reference Points on the facing page .
- To adjust reference points after marking, see Adjusting Map Reference-Point Coordinates on the facing page .

When a leak is detected, it's location is displayed as a red square on the map. See Viewing the Reference Map on the facing page .

Testing Mapped Reference Points

1. Select *Configuration* > *Map*.
2. In Jump to Map, select the map to test, then click *Map Alarm Test*.
   The map opens with all of the reference points and their distances displayed in a red, "leak-detection" box as shown in the following figure.

Figure 5.2 Mapped Reference Points Test



Adjusting Map Reference-Point Coordinates

1. On the Web/Map Settings page, click *Map Alarm Coordinates - Text*.
   Map Alarm Coordinates opens.
2. Update distances and x-y coordinates as needed, then click *Submit Changes*.

Viewing the Reference Map

On the Vertiv™ Liebert® Liqui-tect™ Home Page, click the titled button below the map image for the map to view.
An enlarged reference map opens in a web browser.

Saving a Map Image

We recommend saving a copy of map images along with the back-up configuration file because the map-image files are not saved in the configuration file.

To save a back-up map image:

1. On the Vertiv™ Liebert® Liqui-tect™ Home Page, click the titled button for the map below the image.
   The enlarged map opens in the web browser.
2. Right-click the image, and select *Save Image As* from the pop-up menu.
   The Save Image dialog opens.
3. Browse to the location of the back-up configuration file, enter a descriptive file name if needed, and save the image.

Deleting a map

1. Select *Configuration* > *Map*.
   Map Settings on page 35 opens.
2. In Jump to Map, select the map to delete.
3. Click *Delete Image N*, where "N" is the number of the image file to delete.
   The file is deleted.

5.3.9 Clock Configuration

The Clock page adjusts the date and time settings for LP6000.

Table 5.9 Clock Configuration Fields and Options

Field	Description
Date	Sets the current date.
Time	Sets the current time.
Day	Display-only, day of week calculated from date setting.

5.3.10 NTP Configuration

The NTP (Network Time Protocol) synchronizes computer-system clocks on connected devices. This maintains accuracy and reliability for time-stamped events.

Table 5.10 NTP Configuration Fields and Options

Field	Description
NTP Server	IP address or host name of NTP server with which LP6000 synchronizes time. Public servers include us.pool.ntp.org or time.nist.gov.
Update Interval	Frequency at which synchronization occurs. Zero (0) disables synchronization.
Select Time Zone	Sets the time zone employed.
Daylight Savings Time	Enables/Disables use of Daylight Savings Time. When enabled, selects the time at which savings time goes into effect.
DST Begin Date	Selects the day/month daylight savings begins.
DST End Date	Selects the day/month daylight savings ends.

5.3.11 Email-SMTP/DNS Configuration

The Email-SMTP/DNS page configures email and SMTP settings.

Table 5.11 Email Configuration Fields and Options

Field	Description
Access Type	Enables/Disables e-mail alerts via local network connection. • LAN = enable e-mail alerts. • None = disables alerts.
Email Contamination Alarms	Enables/Disables e-mail alerts for contamination alarms. Disable in the case of frequent false alarms.
Primary DNS Server	IP address of primary DNS server (provided by internet service provider).
Secondary DNS Server	IP address of secondary DNS server (provided by internet service provider).
Mail (SMTP) Server	URL of mail server.
Mail Sender Address	Address for mail sent by Liebert® Liqui-tect™.
Mail Subject	Subject line of e-mail.
Mail Recipient (1)	Address of e-mail recipient.
Mail Recipient (2)	Address of e-mail recipient.
Mail Recipient (3)	Address of e-mail recipient.
Mail Recipient (4)	Address of e-mail recipient.
Smtp Authentication	For ESMTP, leave at default unless otherwise directed by your IT administrator.
Smtp Username	For ESMTP, leave at default unless otherwise directed by your IT administrator.
Smtp Password	For ESMTP, leave at default unless otherwise directed by your IT administrator.
View Smtp Log / Send Test Email	Opens log of e-mails sent by Liebert® Liqui-tect™ and displays an e-mail test button. See Sending a Test E-mail below .

Sending a Test E-mail

1. Click *Configuration* > *Email-SMTP/DNS*.
   Email-SMTP/DNS Configuration above opens.
2. At the bottom of the page, click *View Smtp Log*.
   The Email Log opens.
3. Click *Send Test E-mail*.
   An e-mail containing the SMTP log is sent.

5.3.12 SNMP/Syslog Configuration

The SNMP/Syslog page configures SNMP communication including SNMP traps. The page also allows testing the traps, refer to the following:

- Sending a Leak-Detection Test Trap on page 41
- Sending a Cable-Break Test Trap on page 41
- Sending a Contamination Test Trap on page 41

Table 5.12 MIB-2 System Options

Field	Description
System Name	Name of the system. Displays below the menu bar and is included in e-mail notifications. 30-character limit.
System Contact	Indicates person responsible for the Liebert® Liqui-tect™ system. Only available through SNMP Gets. Not included in e-mail or SNMP Trap notifications. 30-character limit.
System Location	Physical location of the Liebert® Liqui-tect™ system. Not included in e-mail or SNMP Trap notifications.

Table 5.13 V1/V2C Community Names Options

Field	Description
Get/Read	Community for get/read access.
Set/Write	Community for set/write access.
Trap	Community for trap access.

Table 5.14 Traps Options

Field	Description
Select SNMP Trap Type	Selects the version of SNMP trap to use. • V1-Trap • V2C-Trap • V2C-Inform
Max Inform Retries	Number of re-send attempts for un-delivered traps. Zero (0) allows unlimited attempts.
Inform Interval	Length of time between re-send attempts.
Modbus Zone Traps	Enables disables Modbus zone traps.

Table 5.15 Trap Destinations Options

Field	Description
IP Address	IP address of the receiving device. All zeros (0.0.0.0) enables any device to access LP6000 through an MIB browser.
TrapEnable	Enables/Disables if device will receive traps.
Syslog Message	Enables/Disables if device will receive system log messages.

Table 5.16 SnmpV3 Options

Field	Description
Engine ID	Read-only display of engine ID.
Context Name	Alphanumeric name of the SNMP v3 interface.
User Name	Unique name for each user.

Table 5.16 SnmpV3 Options (continued)

Field	Description
Access Mode	Selects mode of access for the user. • No-Auth - requires a user name, but not a password. • Auth-MD5 - requires a user name and password. • PrivAuth-MD5 - requires a user name and password.
Auth-Password	Sets the authentication password. 8 to 24 characters in length.
Priv-Password	Sets the privacy password. 8 to 24 characters in length.

Sending a Leak-Detection Test Trap

1. Click *Configuration* > *SNMP/Syslog*.
   SNMP/Syslog Configuration on page 39 opens.
2. At the bottom of the page, click *Send Test Trap - Leak Detected*.
   The test message is sent.

Sending a Cable-Break Test Trap

1. Click *Configuration* > *SNMP/Syslog*.
   SNMP/Syslog Configuration on page 39 opens.
2. At the bottom of the page, click *Send Test Trap - Cable Break*.
   The test message is sent.

Sending a Contamination Test Trap

1. Click *Configuration* > *SNMP/Syslog*.
   SNMP/Syslog Configuration on page 39 opens.
2. At the bottom of the page, click *Send Test Trap - Contamination*.
   The test message is sent.

5.3.13 EIA-485 Port/Modbus Configuration

Use this port-configuration page to set up the LP6000 controller as a Modbus "primary" to communicate with the "secondary" devices through the EIA-485 or Ethernet ports. For secondary devices, use the web interface of each secondary device to configure communication with the primary LP6000 controller. See Configuring the Controller as a Modbus Primary on the next page for the detailed setup steps.

The page also sets up access to BACnet-MS/TP secondary devices and accesses the Modbus secondary-register log, statistics and packet log. See Viewing the Modbus Secondary Register Log on the next page , Viewing the Modbus Statistics on the next page and Viewing the Modbus Packet Log on the next page .

NOTE: The options listed may differ from your screen depending on the port function selected.

Table 5.17 Modbus/EIA-485 Configuration Fields and Options

Field	Description
Modbus/TCP/UDP Secondary Unit Identifier	If using the Ethernet port for a primary/secondary setup, selects the secondary-unit number designation for the device.
EIA-485 Port Function	Selects the function of the EIA-485 port for the LP6000 controller: • Modbus-Secondary • Bacnet-MS/TP-Secondary (only available on port 2) • Modbus-Primary Note: Click *Submit Changes* after making the selection to display the options for selected function. See Configuring the Controller as a Modbus Primary below .
EIA-485 Baud Rate	Selects the baud rate for the port.
EIA-485 Parity	Selects the parity for the port.
EIA-485 Secondary Address	Selects the secondary address for the port.

Viewing the Modbus Secondary Register Log

1. Click *Configuration* > *EIA-485 Port/Modbus*.
   EIA-485 Port/Modbus Configuration on the previous page opens.
2. At the bottom of the page, click *Modbus Secondary Register Display Log/Statistics*.
   The log opens in the web browser.

Viewing the Modbus Statistics

1. Click *Configuration* > *EIA-485 Port/Modbus*.
   EIA-485 Port/Modbus Configuration on the previous page opens.
2. At the bottom of the page, click *Modbus Statistics*.
   The log opens in the web browser.

Viewing the Modbus Packet Log

1. Click *Configuration* > *EIA-485 Port/Modbus*.
   EIA-485 Port/Modbus Configuration on the previous page opens.
2. At the bottom of the page, click *Modbus Packet Log*.
   The log opens in the web browser.

5.3.14 Configuring the Controller as a Modbus Primary

The LP6000 controller can monitor and control other Vertiv™ Liebert® Liqui-tect™ units in a "primary/secondary" configuration using Modbus communication. Other Liebert® Liqui-tect™ panels can be connected and their status and alarms viewed through the "primary" controller.

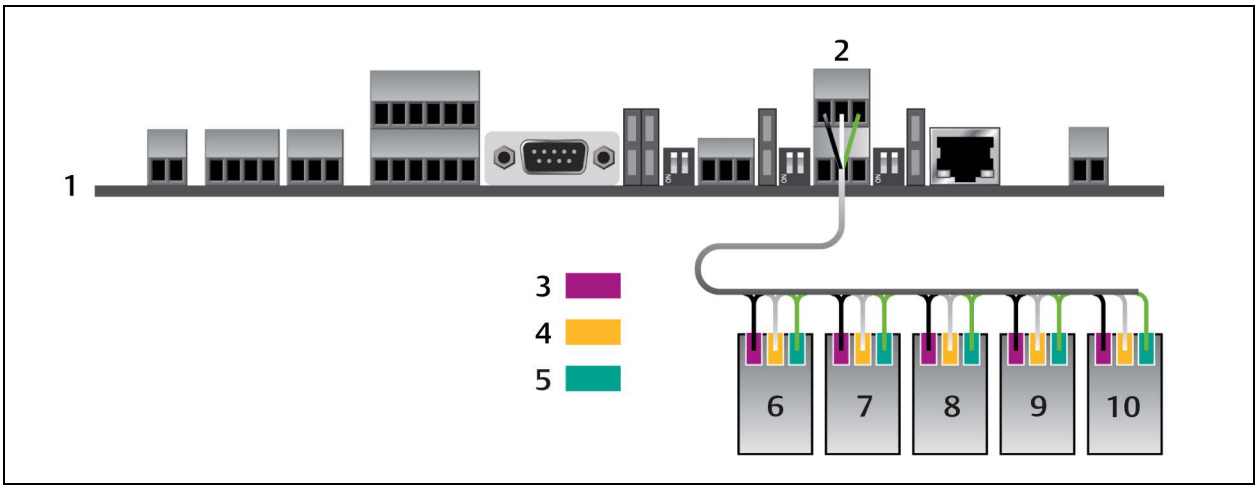
Setting up a Primary/Secondary system requires two steps. Connecting the secondary units to the primary unit, then configuring the Modbus communication settings for each device depending on type of connection:

- Connecting to the EIA-485 Port on the facing page .
- Connecting to the Ethernet Ports on page 45 .

Connecting to the EIA-485 Port

1. Referring to the EIA-485 connection diagram below, use a 2-wire configuration to connect the EIA-485 ports of the primary and secondary units in a daisy chain.

Figure 5.3 EIA-485 Connection Diagram



Item	Description
1	Primary device - secondary address 1 Note: The EIA-485 Secondary Address must be 1 for the primary device.
2	TB6 - EIA-485 port
3	TX+/RX+ wire
4	TX–/RX– wire
5	Shield wire
6	Secondary device - secondary address 2. Note: If you have virtual zones configured, the serial addresses start after the virtual zones. For example, if this set up had 5 virtual zones, the secondary addresses would start at 7.
7	Secondary device - secondary address 3 Note: Each secondary address must be consecutive.
8	Secondary device - secondary address 4
9	Secondary device - secondary address 5
10	Secondary device - secondary address 6

2. Configure the primary device:
    - Open the web UI for the LP6000 primary controller and click *Configuration* > *EIA-485 Port/Modbus*. EIA-485 Port/Modbus Configuration on page 41 opens.
    - In Select EIA-485 Port Function, select *Modbus-Primary*.
    - Select the EIA-485 Baud Rate and EIA-485 Parity.
    - In EIA-485 Secondary Address, enter **1**.
    - Click *Submit Changes*.
      The controller is configured as the primary device.

NOTE: The Secondary Address for the Primary device must be 1.

3. Configure the secondary device:

NOTE: The serial address must be identical to the zone number.

    - Open the web UI for the secondary device, and click *Configuration* > *EIA-485 Port/Modbus*. EIA-485 Port/Modbus Configuration on page 41 opens for the secondary unit.
    - In Select EIA-485 Port Function, select *Modbus-Secondary*.
    - Select the EIA-485 Baud Rate and EIA-485 Parity to match that of the Modbus primary.
    - In EIA-485 Secondary Address, enter the secondary address of the device. Start with the first available address and assign the next consecutive number to each unit in the chain.
    - Click *Submit Changes*.
4. Repeat Step 3 for each secondary device.
5. Configure the physical zones:

NOTE: The zone number and the secondary address of the device must be identical.

    - Open the web UI for the primary controller, and click *Configuration* > *Secondary Controller*. Secondary Controller Settings on page 32 opens.
    - In Enable Comm Type, select *RS-485*.
    - Click *Submit Changes*.

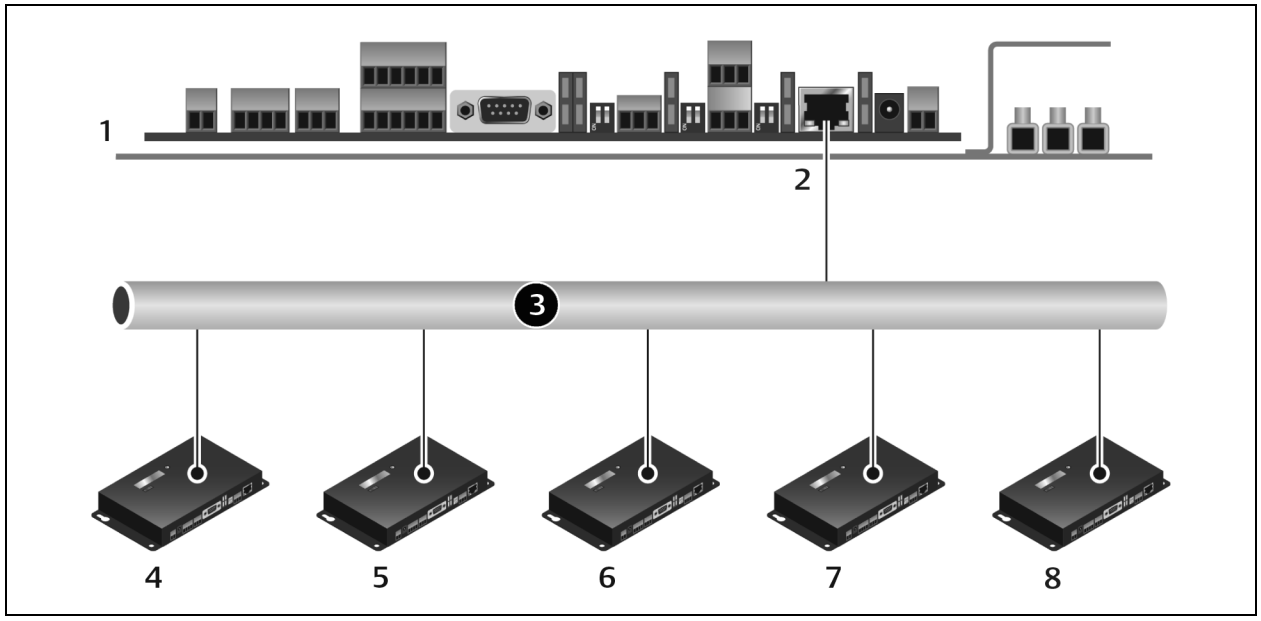
We recommend generating an alarm from each secondary unit to confirm proper communication.

Connecting to the Ethernet Ports

When used as a Modbus primary, LP6000 can be connected to the secondary units via the local network connection, using TCP/IP or UDP/IP as follows:

1. Referring to the Ethernet-port connection diagram below, connect the Ethernet port of the primary unit to the local area network.
2. Connect the Ethernet ports of the secondary units to the local area network.

Figure 5.4 Ethernet Port Connection Diagram



Item	Description
1	Primary device - Secondary ID 1 Note: The Secondary ID must be 1 for the primary device.
2	P2 - Ethernet port
3	Local Area Network
4	Secondary device - Secondary ID 2. Note: If you have virtual zones configured, the secondary IDs start after the virtual zones. For example, if this set up had 5 virtual zones, the secondary IDs would start at 7.
5	Secondary device - Secondary ID 3 Note: Each secondary ID must be consecutive.
6	Secondary device - Secondary ID 4
7	Secondary device - Secondary ID 5
8	Secondary device - Secondary ID 6

NOTE: Modbus communication uses port #502 for the IP address.

3. Configure the primary device:
   - Open the web UI for the LP6000 primary controller and click *Configuration* > *EIA-485 Port/Modbus*. EIA-485 Port/Modbus Configuration on page 41 opens.
   - In Modbus/TCP/UDP Secondary Unit Identifier, enter **1**.
   - Click *Submit Changes*.
     The controller is configured as the primary device.

NOTE: The Secondary ID for the Primary device must be 1.

4. Configure the secondary devices:
   - Open the web UI for the secondary device, and click *Configuration* > *EIA-485 Port/Modbus*. EIA-485 Port/Modbus Configuration on page 41 opens for the secondary device.
   - In Modbus/TCP/UDP Secondary Unit Identifier, enter the secondary ID of the device. Start with the first available ID and assign the next consecutive number to each unit in the chain.
   - Click *Submit Changes*.

NOTE: The secondary ID must be identical to the zone number.

5. Repeat Step 4 for each secondary device.
6. Configure the physical zones:

NOTE: The zone number and the secondary ID of the device must be identical.

   - Open the web UI for the primary controller, and click *Configuration* > *Secondary Controller*. Secondary Controller Settings on page 32 opens.
   - In Address/Secondary ID/Device ID, enter the secondary ID.
   - In Enable Comm Type, select *Modbus TCP* or *Modbus UDP* depending on the device.
   - In IP Address, enter the IP address for the device.
   - Click *Submit Changes*

We recommend generating an alarm from each unit to confirm proper communication.

5.3.15 BACnet Configuration

Use the BACnet page to configure control and monitoring of the Vertiv™ Liebert® Liqui-tect™ system by a building-management system (BMS).

This page also sets up alarm notifications via BACnet. See BACnet Alarm Notifications on the facing page for a description of the options and set up.

The page also lists the BACnet objects and accesses the packet log. See Viewing the BACnet Packet Log on page 48 .

Table 5.18 BACnet Configuration Fields and Options

Field	Description
BACnet Device Name	Unique name for the LP6000 controller. 30-character limit.
BACnet Device ID	Device ID number for the LP6000. 30-character limit. 0 (zero) = disabled.
BACnet Device Description	Description of the LP6000 device. 30-character limit.
BACnet UDP Port	Specifies UDP port used by the application. Enter 0 (zero) to specify port 47808 (0xBAC0) as the UPD port. If your application specifies a different port, enter that value here. Default: 0

Table 5.18 BACnet Configuration Fields and Options (continued)

Field	Description
BACnet MS/TP Max Primary	Sets the secondary address. Valid values: 1 to 127. 0 (zero) = secondary-only. Default: 0
Register as Foreign Device at IP	IP address of primary device with which to communicate. Requires a BBMD for foreign-device discovery.
Registration Time-to-Live	Time, in seconds, for foreign-device discovery.
Foreign Device Table #1	Display-only, content read from Register Foreign Device at IP and Registration Time-to-Live fields.
Foreign Device Table #2	Display-only, content read from Register Foreign Device at IP and Registration Time-to-Live fields.
BACnet BBMD-BDT	Used by some BACnet primaries for discovery on different subnets.
LP6000 IP Address	Display-only, IP address configured via Network/IP link.
(Primary) #1 IP Address	IP address of primary device connected via BACnet communication.
#2 to #4 IP Address	IP addresses of devices connected via BACnet communication.

BACnet Alarm Notifications

This section of BACnet Configuration sets-up alarm-event notifications via BACnet communication.

To set-up and test notifications:

1. Enter the settings, and click *Submit Changes*.

NOTE: If you do not submit changes before sending the test e-mail, the updates will be lost.

2. At the bottom of the page, click *Send Test Alarms*.
   The test notifications are sent.
3. Verify that the test notifications are correctly sent and received.
   - To clear the test notifications once verified, click *Clear Test Alarms*.

Table 5.19 BACnet Alarm Event Settings

Field	Description
Recipient #1 IP Address	Address to which alarm notifications are sent.
PID	Process identifier.
Notification type	Selects whether or not the alarm notification requires acknowledgment. • Unconfirmed = no acknowledgment needed. • Confirmed = acknowledgment required. Default: Unconfirmed.
Notification Class	List of devices to receive notification.
Priority	Designates a priority in the event of conflicting control situations.
Leak Detected Alarms	Selects the format of the leak-detection alarm notification.
APDU_Timeout	Time between re-transmission, in milliseconds, of an un-acknowledged APDU (when acknowledgment is required).
Number_of_APDU_Retries	Maximum number of re-transmission attempts.

Viewing the BACnet Packet Log

1. Click *Configuration* > *Bacnet*.
   BACnet Configuration on page 46 opens.
2. At the bottom of the page, click *Bacnet Packet Log*.
   The log opens in the web browser.

5.3.16 Alarm Management

The Alarm Management page resets active alarms and manages alarm history with the following options:

- Silencing an Audible Alarm below
- Resetting a Leak-Detection Alarm below
- Acknowledging a Preventative Maintenance Alarm below
- Clearing the Alarm History below
- Acknowledging Un-sent E-mail on the facing page
- Acknowledging SNMP Informs on the facing page
- Logging an Alarm for Power Cycle on the facing page

Silencing an Audible Alarm

1. Click *Configuration* > *Alarm Management*.
   Alarm Management above opens.
2. Click *Silence Audible Alarm*.
   The audible notification is silenced.

Resetting a Leak-Detection Alarm

1. Click *Configuration* > *Alarm Management*.
   Alarm Management above opens.
2. Click *Reset Leak Alarm*.
   The alarm is reset and audible notification silenced (if sounding).

Acknowledging a Preventative Maintenance Alarm

1. Click *Configuration* > *Alarm Management*.
   Alarm Management above opens.
2. Click *Acknowledge Preventative Maintenance Alarm*.
   The alarm is acknowledged.

Clearing the Alarm History

1. Click *Configuration* > *Alarm Management*.
   Alarm Management above opens.
2. Click *Clear Alarm History*.
   The history clears.

Acknowledging Un-sent E-mail

1. Click *Configuration* > *Alarm Management*.
   Alarm Management on the previous page opens.
2. Click *Acknowledge Unsent Emails*.
   The e-mails are acknowledged.

Acknowledging SNMP Informs

1. Click *Configuration* > *Alarm Management*.
   Alarm Management on the previous page opens.
2. Click *Acknowledge Snmp Informs*.
   The informs are acknowledged.

Logging an Alarm for Power Cycle

When enabled, an alarm event occurs each time LP6000 powers-on, which logs each time the LP6000 power-cycles in the alarm history for later review.

1. Click *Configuration* > *Alarm Management*.
   Alarm Management on the previous page opens.
2. Click to check Enable Power Up Alarm Logging, then click *Submit*.
   An alarm event is logged each time the system powers-on.

5.3.17 System/Flash Management

The System Management page offers firmware-management functions, LCD Display management, and configuration backup.

- Backing Up Configuration Settings on the next page
- Restoring Factory Default Settings on the next page
- Updating Firmware on page 51
- Capturing LCD Display screens on page 51
- Updating LCD Display Firmware on page 51

Backing Up Configuration Settings

Once you have adjusted the configuration of the LP6000, save a back-up configuration file to a safe place. The configuration file can be used to restore the system and to copy to other LP6000 units.

All parameters, including x-y coordinates for the interactive reference map are saved. Only the map image file is not saved in the configuration file. See Saving a Map Image on page 37 to back up the map image.

To back up configuration settings:

1. Select *Configuration* > *System/Flash Management*.
   System/Flash Management on the previous page opens.
2. Click *Download Configuration File (.cfg)*.
   The file is downloaded.
3. Save the downloaded file to a computer or USB drive.
   - If necessary, update the file name with a descriptive name for your configuration.
   - Do not change the file extension, .cfg. If the extension is changed, the file is not recognized when you attempt to upload.

Restoring Factory Default Settings

Use the Bootloader to restore the factory-default configuration.

1. Save a back-up copy of the current settings in case you must re-load them. See Backing Up Configuration Settings above .
2. Select *Configuration* > *System/Flash Management*.
   System/Flash Management on the previous page opens.
3. Click *Exit to Bootloader*.
   The Bootloader opens in the web browser.
4. Click *Restore Factory Defaults*.
   The settings are restored to defaults.
5. Click *Start Application* to restart and return to the web interface.

Restoring Back-up Configuration Settings

1. Select *Configuration* > *System/Flash Management*.
   System/Flash Management on the previous page opens.
2. Click *Choose File* and browse to select the configuration (.cfg), then click *Upload*.
   The configuration uploaded, and the web interface opens when the update is complete.

Updating Firmware

LP6000 firmware updates are available from technical support: Telephone: 800-222-5877 option 2, Outside the US: 614-841-6755, E-mail: Liebert.monitoring@vertiv.com

1. Obtain the updated firmware (.bin file), and save it to local disk.

NOTE: Do not change the file name. If the file name is changed, it will not be recognized by LP6000 and the update will fail.

2. Select *Configuration* > *System/Flash Management*.
   System/Flash Management on page 49 opens.
3. Click *Choose File* and browse to select the firmware (.bin), then click *Upload*.
   The configuration uploaded. The currently-loaded firmware version is displayed in the Flash Application field on the Identity Page on page 30 .

Capturing LCD Display screens

You can capture, and download screen captures of the current LDC display.

1. On the LCD display, navigate to the screen to capture.
2. On the web UI, select *Configuration* > *System/Flash Management*.
   System/Flash Management on page 49 opens.
3. Click *LCD Capture*.
   The displayed screen is captured.
4. Click *Download LCD Capture File*.
   The captured image opens in the web browser.
5. Right-click the image, and *Save image as* to save the file with a descriptive name.

Updating LCD Display Firmware

1. On the web UI, select *Configuration* > *System/Flash Management*.
   System/Flash Management on page 49 opens.
2. Click *LCD Program* and OK to confirm
   The LCD display firmware updates.

5.4 Historical Data

Historical data is a time-stamped list of events in the alarm-history log and current-leakage trend log.

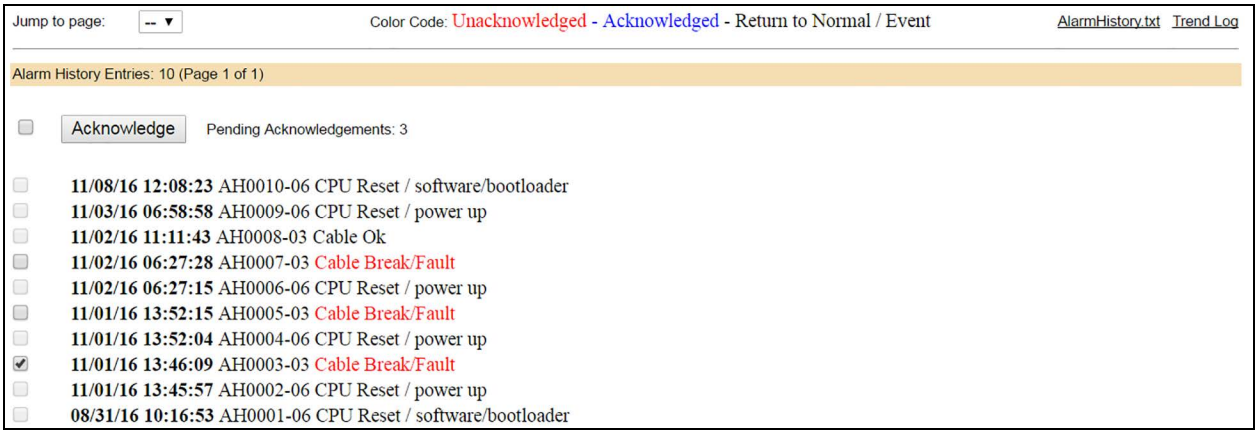
The alarm events are color coded to indicate whether or not it is acknowledged. See Acknowledging Alarm History Events below .

The time-stamp format for each event, MM/DD/YY HH:MM:SS. AHxxxx-yy, is described in the following table.

Table 5.20 History Time Stamp Format

Item	Description
MM/DD/YY	number of month/day of month/year
HH:MM:SS	Hour/Minute/Second (24-hour format)
text	Details about the event.
AH	Alarm History
xxxx	Log-entry number for the event.
yy	Event code indicating type of event: 03 – Cable Fault 04 – Leak Detected 05 – Contamination Detected 06 – Reset/Power Up

Figure 5.5 Historical Data Page



5.4.1 Acknowledging Alarm History Events

1. On the Historical Data above page, click check the boxes next to the un-acknowledged alarms (description text is red).

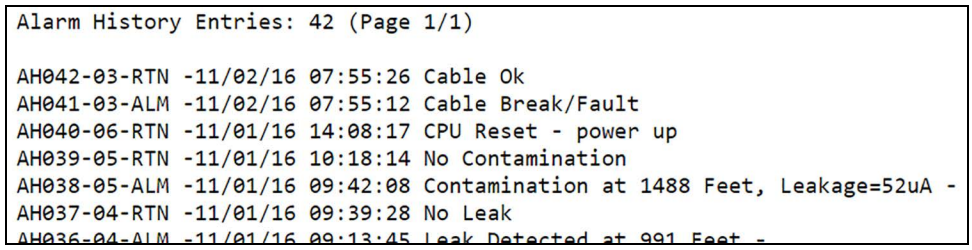
NOTE: Only events with active check boxes may be acknowledged.

2. Click *Acknowledge*.
   The checked alarms are acknowledged and their description text changes to blue.

5.4.2 History Text Files for Download

1. On the Historical Data on the previous page page, click *AlarmHistory.txt*.
   The .txt file opens in a web browser.
2. Download the file.

Figure 5.6 Alarm History Text File Example



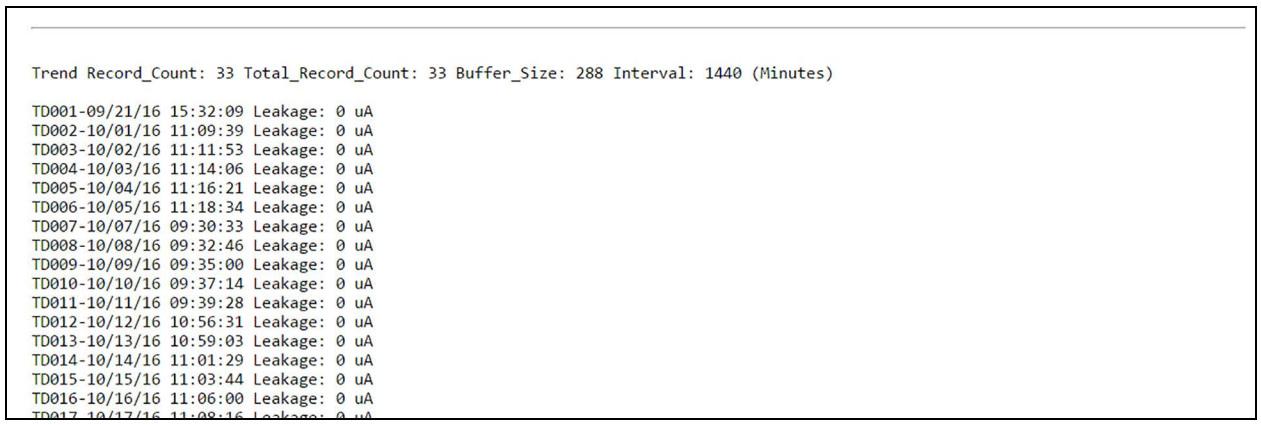
```
Alarm History Entries: 42 (Page 1/1)

AH042-03-RTN -11/02/16 07:55:26 Cable Ok
AH041-03-ALM -11/02/16 07:55:12 Cable Break/Fault
AH040-06-RTN -11/01/16 14:08:17 CPU Reset - power up
AH039-05-RTN -11/01/16 10:18:14 No Contamination
AH038-05-ALM -11/01/16 09:42:08 Contamination at 1488 Feet, Leakage=52uA -
AH037-04-RTN -11/01/16 09:39:28 No Leak
AH036-04-ALM -11/01/16 09:13:45 Leak Detected at 991 Feet -
```

5.4.3 Viewing the Current Leakage Trends

The trend of current leakage assists in troubleshooting leaks and inaccurate readings.

- On the Historical Data on the previous page page, click *Trend Log*.
  The trend log opens.

Figure 5.7 Trend Log of Current Leakage



```
Trend Record_Count: 33 Total_Record_Count: 33 Buffer_Size: 288 Interval: 1440 (Minutes)

TD001-09/21/16 15:32:09 Leakage: 0 uA
TD002-10/01/16 11:09:39 Leakage: 0 uA
TD003-10/02/16 11:11:53 Leakage: 0 uA
TD004-10/03/16 11:14:06 Leakage: 0 uA
TD005-10/04/16 11:16:21 Leakage: 0 uA
TD006-10/05/16 11:18:34 Leakage: 0 uA
TD007-10/07/16 09:30:33 Leakage: 0 uA
TD008-10/08/16 09:32:46 Leakage: 0 uA
TD009-10/09/16 09:35:00 Leakage: 0 uA
TD010-10/10/16 09:37:14 Leakage: 0 uA
TD011-10/11/16 09:39:28 Leakage: 0 uA
TD012-10/12/16 10:56:31 Leakage: 0 uA
TD013-10/13/16 10:59:03 Leakage: 0 uA
TD014-10/14/16 11:01:29 Leakage: 0 uA
TD015-10/15/16 11:03:44 Leakage: 0 uA
TD016-10/16/16 11:06:00 Leakage: 0 uA
TD017-10/17/16 11:08:16 Leakage: 0 uA
```

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6 Modbus Communication Protocol

This section describes the Modbus protocol supported by LP6000 for use when configuring communication via Modbus network.

LP6000 communicates via the half-duplex EIA-485 serial-communication standard. Vertiv™ Liebert® Liqui-tect™ LP6000 may be configured as a primary or secondary device with multiple devices on a multi-drop network.

6.1 Transmission Modes

LP6000 supports only RTU mode of transmission (does not support ASCII) with 8 data bits, no parity, and 1 stop bit.

Each packet consists of the following four fields:

- Secondary Address Field: 1-byte length. Identifies the secondary device in the transaction. Set on EIA-485 Port/Modbus Configuration on page 41 .
- Function Field: 1-byte length. Indicates the function to perform. Supported functions are 03 (Read 4xxxx output registers), 04 (Read 3xxxx input registers), 06 (Preset single register) and 16 (Preset multiple registers).
- Data Field: variable length. 16-bit registers, transmitted high-order-byte first (big-endian).
- Error Check (Checksum) Field: Identifies transmission errors. Uses a 16-bit cyclic redundancy check (CRC-16).

6.1.1 Exception Responses

Exception responses are generated as a result of invalid commands from the Modbus primary or an attempt to read and invalid register. The high-order bit of the function code is set to 1. The data field contains the exception error code, described in the following table.

Table 6.1 Exception Codes

Code	Name	Description
01	Illegal Function	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.

6.2 Modbus Packet Communication

A description of the packet registers.

6.2.1 Function 03: Read Output Registers

To read the parameter values, the primary 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 6.2 Read Output Register Packet Structure

Read Register Request Packet	Read Registers Response Packet
Secondary Address (1 byte)	Secondary 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 6.3 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	Spare			0-65535
40004	Spare			0-65535
40005	Spare			0-65535
40006	Spare			0-65535
40007	Spare			0-65535
40008	Spare			0-65535
40009	Spare			0-65535
40010	Spare			0-65535
40011	Spare			0-65535
40012	Spare			0-65535
40013	Spare			0-65535
40014	Spare			0-65535

Table 6.3 Output Registers (continued)

Register	Name	Description	Units	Range
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

6.2.2 Function 04: Read Input Registers

To read the input values, the primary 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 6.4 Read Output Register Packet Structure

Read Register Request Packet	Read Registers Response Packet
Secondary Address (1 byte)	Secondary 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 6.5 Input Registers

Register	Name	Description	Units	Range
30001	Status	Bit level status 00 : 1 = Leak is Detected 01 : 1 = Cable Break Alarm 02 : 1 = Contamination is Detected 03-15 : Spare	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 Resistance	Resistance of cable	Ohms	0-65535
30007	Loop2 Resistance	Resistance of cable	Ohms	0-65535
30008	Resistance per foot	Resistance of cable	Ohms x 1000	0-65535
30009	Firmware Version	Firmware version	xx.xx X 100	0-65535
30010	Virtual Zone Alarm Status	Bit Level Status	None	0-65535

Table 6.5 Input Registers (continued)

Register	Name	Description	Units	Range
	(00=Zone1…15=Zone16)	Zone 1 through Zone 16		
30011	Virtual Zone Alarm Status (00=Zone17…15=Zone32)	Bit Level Status Zone 17 through Zone 32	None	0-65535
38001	Leak Location Float Values	Location of leak in meters (float-MSW)	None	0-65535
38002	Leak Location Float Values	Location of leak in meters (float-MSW)	None	0-65535
30012	Modbus Zone Enabled Flags (00=Modbus Zone 2… 15=Modbus Zone 16)	Bit Level Status Modbus Zone 2 through Modbus Zone 16	None	0-65535
30013	Modbus Zone2 Status	Bit Level Status	None	0-65535
30014	Modbus Zone2 Distance	Location of leak	Ft/Meters	0-65535
30015	Modbus Zone3 Status	Bit Level Status	None	0-65535
30016	Modbus Zone3 Distance	Location of leak	Ft/Meters	0-65535
30017	Modbus Zone4 Status	Bit Level Status	None	0-65535
30018	Modbus Zone4 Distance	Location of leak	Ft/Meters	0-65535
30019	Modbus Zone5 Status	Bit Level Status	None	0-65535
30020	Modbus Zone5 Distance	Location of leak	Ft/Meters	0-65535
30021	Modbus Zone6 Status	Bit Level Status	None	0-65535
30022	Modbus Zone6 Distance	Location of leak	Ft/Meters	0-65535
30023	Modbus Zone7 Status	Bit Level Status	None	0-65535
30024	Modbus Zone7 Distance	Location of leak	Ft/Meters	0-65535
30025	Modbus Zone8 Status	Bit Level Status	None	0-65535
30026	Modbus Zone8 Distance	Location of leak	Ft/Meters	0-65535
30027	Modbus Zone9 Status	Bit Level Status	None	0-65535
30028	Modbus Zone9 Distance	Location of leak	Ft/Meters	0-65535
30029	Modbus Zone10 Status	Bit Level Status	None	0-65535
30030	Modbus Zone10 Distance	Location of leak	Ft/Meters	0-65535
30031	Modbus Zone11 Status	Bit Level Status	None	0-65535
30032	Modbus Zone11 Distance	Location of leak	Ft/Meters	0-65535
30033	Modbus Zone12 Status	Bit Level Status	None	0-65535
30034	Modbus Zone12 Distance	Location of leak	Ft/Meters	0-65535
30035	Modbus Zone13 Status	Bit Level Status	None	0-65535
30036	Modbus Zone13 Distance	Location of leak	Ft/Meters	0-65535
30037	Modbus Zone14 Status	Bit Level Status	None	0-65535
30038	Modbus Zone14 Distance	Location of leak	Ft/Meters	0-65535
30039	Modbus Zone15 Status	Bit Level Status	None	0-65535

Table 6.5 Input Registers (continued)

Register	Name	Description	Units	Range
30040	Modbus Zone15 Distance	Location of leak	Ft/Meters	0-65535
30041	Modbus Zone16 Status	Bit Level Status	None	0-65535
30042	Modbus Zone16 Distance	Location of leak	Ft/Meters	0-65535
30043	Modbus Zone Enabled Flags (00=Modbus Zone 17… 15=Modbus Zone 32)	Bit Level Status Modbus Zone 17 through Modbus Zone 32	None	0-65535
30044	Modbus Zone17 Status	Bit Level Status	None	0-65535
30045	Modbus Zone17 Distance	Location of leak	Ft/Meters	0-65535
30046	Modbus Zone18 Status	Bit Level Status	None	0-65535
30047	Modbus Zone18 Distance	Location of leak	Ft/Meters	0-65535
30048	Modbus Zone19 Status	Bit Level Status	None	0-65535
30049	Modbus Zone19 Distance	Location of leak	Ft/Meters	0-65535
30050	Modbus Zone20 Status	Bit Level Status	None	0-65535
30051	Modbus Zone20 Distance	Location of leak	Ft/Meters	0-65535
30052	Modbus Zone21 Status	Bit Level Status	None	0-65535
30053	Modbus Zone21 Distance	Location of leak	Ft/Meters	0-65535
30054	Modbus Zone22 Status	Bit Level Status	None	0-65535
30055	Modbus Zone22 Distance	Location of leak	Ft/Meters	0-65535
30056	Modbus Zone23 Status	Bit Level Status	None	0-65535
30057	Modbus Zone23 Distance	Location of leak	Ft/Meters	0-65535
30058	Modbus Zone24 Status	Bit Level Status	None	0-65535
30059	Modbus Zone24 Distance	Location of leak	Ft/Meters	0-65535
30060	Modbus Zone25 Status	Bit Level Status	None	0-65535
30061	Modbus Zone25 Distance	Location of leak	Ft/Meters	0-65535
30062	Modbus Zone26 Status	Bit Level Status	None	0-65535
30063	Modbus Zone26 Distance	Location of leak	Ft/Meters	0-65535
30064	Modbus Zone2 7 Status	Bit Level Status	None	0-65535
30065	Modbus Zone27 Distance	Location of leak	Ft/Meters	0-65535
30066	Modbus Zone28 Status	Bit Level Status	None	0-65535
30067	Modbus Zone28 Distance	Location of leak	Ft/Meters	0-65535
30068	Modbus Zone29 Status	Bit Level Status	None	0-65535
30069	Modbus Zone29 Distance	Location of leak	Ft/Meters	0-65535
30070	Modbus Zone30 Status	Bit Level Status	None	0-65535
30071	Modbus Zone30 Distance	Location of leak	Ft/Meters	0-65535

Table 6.5 Input Registers (continued)

Register	Name	Description	Units	Range
30072	Modbus Zone31 Status	Bit Level Status	None	0-65535
30073	Modbus Zone31 Distance	Location of leak	Ft/Meters	0-65535
30074	Modbus Zone32 Status	Bit Level Status	None	0-65535
30075	Modbus Zone32 Distance	Location of leak	Ft/Meters	0-65535
30076	Modbus Zone Enabled Flags (00=Modbus Zone 33… 15=Modbus Zone 48)	Bit Level Status Modbus Zone 33 through Modbus Zone 48	None	0-65535
30077	Modbus Zone33 Status	Bit Level Status	None	0-65535
30078	Modbus Zone33 Distance	Location of leak	Ft/Meters	0-65535
30079	Modbus Zone34 Status	Bit Level Status	None	0-65535
30080	Modbus Zone34 Distance	Location of leak	Ft/Meters	0-65535
30081	Modbus Zone35Status	Bit Level Status	None	0-65535
30082	Modbus Zone35 Distance	Location of leak	Ft/Meters	0-65535
30083	Modbus Zone36 Status	Bit Level Status	None	0-65535
30084	Modbus Zone36 Distance	Location of leak	Ft/Meters	0-65535
30085	Modbus Zone37 Status	Bit Level Status	None	0-65535
30086	Modbus Zone37 Distance	Location of leak	Ft/Meters	0-65535
30087	Modbus Zone38 Status	Bit Level Status	None	0-65535
30088	Modbus Zone38 Distance	Location of leak	Ft/Meters	0-65535
30089	Modbus Zone39 Status	Bit Level Status	None	0-65535
30090	Modbus Zone39 Distance	Location of leak	Ft/Meters	0-65535
30091	Modbus Zone40 Status	Bit Level Status	None	0-65535
30092	Modbus Zone40Distance	Location of leak	Ft/Meters	0-65535
30093	Modbus Zone41 Status	Bit Level Status	None	0-65535
30094	Modbus Zone41 Distance	Location of leak	Ft/Meters	0-65535
30095	Modbus Zone42 Status	Bit Level Status	None	0-65535
30096	Modbus Zone42 Distance	Location of leak	Ft/Meters	0-65535
30097	Modbus Zone43 Status	Bit Level Status	None	0-65535
30098	Modbus Zone43 Distance	Location of leak	Ft/Meters	0-65535
30099	Modbus Zone44 Status	Bit Level Status	None	0-65535
30100	Modbus Zone44 Distance	Location of leak	Ft/Meters	0-65535
30101	Modbus Zone45 Status	Bit Level Status	None	0-65535
30102	Modbus Zone45 Distance	Location of leak	Ft/Meters	0-65535
30103	Modbus Zone46 Status	Bit Level Status	None	0-65535

Table 6.5 Input Registers (continued)

Register	Name	Description	Units	Range
30104	Modbus Zone46 Distance	Location of leak	Ft/Meters	0-65535
30106	Modbus Zone47 Status	Bit Level Status	None	0-65535
30107	Modbus Zone47 Distance	Location of leak	Ft/Meters	0-65535
30108	Modbus Zone48Status	Bit Level Status	None	0-65535
30109	Modbus Zone Enabled Flags (00=Modbus Zone 49… 15=Modbus Zone 64)	Bit Level Status Modbus Zone 49 through Modbus Zone 64	None	0-65535
30110	Modbus Zone49 Status	Bit Level Status	None	0-65535
30111	Modbus Zone49 Distance	Location of leak	Ft/Meters	0-65535
30112	Modbus Zone50 Status	Bit Level Status	None	0-65535
30113	Modbus Zone50 Distance	Location of leak	Ft/Meters	0-65535
30114	Modbus Zone51Status	Bit Level Status	None	0-65535
30115	Modbus Zone51 Distance	Location of leak	Ft/Meters	0-65535
30116	Modbus Zone52 Status	Bit Level Status	None	0-65535
30117	Modbus Zone52 Distance	Location of leak	Ft/Meters	0-65535
30118	Modbus Zone53 Status	Bit Level Status	None	0-65535
30119	Modbus Zone53 Distance	Location of leak	Ft/Meters	0-65535
30120	Modbus Zone54 Status	Bit Level Status	None	0-65535
30121	Modbus Zone54 Distance	Location of leak	Ft/Meters	0-65535
30122	Modbus Zone55 Status	Bit Level Status	None	0-65535
30123	Modbus Zone55 Distance	Location of leak	Ft/Meters	0-65535
30124	Modbus Zone56 Status	Bit Level Status	None	0-65535
30125	Modbus Zone56 Distance	Location of leak	Ft/Meters	0-65535
30126	Modbus Zone57 Status	Bit Level Status	None	0-65535
30127	Modbus Zone57 Distance	Location of leak	Ft/Meters	0-65535
30128	Modbus Zone58 Status	Bit Level Status	None	0-65535
30129	Modbus Zone58 Distance	Location of leak	Ft/Meters	0-65535
30130	Modbus Zone59 Status	Bit Level Status	None	0-65535
30131	Modbus Zone59 Distance	Location of leak	Ft/Meters	0-65535
30132	Modbus Zone60 Status	Bit Level Status	None	0-65535
30133	Modbus Zone60 Distance	Location of leak	Ft/Meters	0-65535
30134	Modbus Zone61 Status	Bit Level Status	None	0-65535
30135	Modbus Zone61 Distance	Location of leak	Ft/Meters	0-65535
30136	Modbus Zone62 Status	Bit Level Status	None	0-65535

Table 6.5 Input Registers (continued)

Register	Name	Description	Units	Range
30137	Modbus Zone62 Distance	Location of leak	Ft/Meters	0-65535
30138	Modbus Zone63 Status	Bit Level Status	None	0-65535
30139	Modbus Zone63 Distance	Location of leak	Ft/Meters	0-65535
30140	Modbus Zone64Status	Bit Level Status	None	0-65535
30141	Modbus Zone64 Distance	Location of leak	Ft/Meters	0-65535
30142	Modbus Zone Enabled Flags (00=Modbus Zone 65… 15=Modbus Zone 80)	Bit Level Status Modbus Zone 65 through Modbus Zone 80	None	0-65535
30143	Modbus Zone65 Status	Bit Level Status	None	0-65535
30144	Modbus Zone65 Distance	Location of leak	Ft/Meters	0-65535
30145	Modbus Zone66 Status	Bit Level Status	None	0-65535
30146	Modbus Zone66 Distance	Location of leak	Ft/Meters	0-65535
30147	Modbus Zone67 Status	Bit Level Status	None	0-65535
30148	Modbus Zone67 Distance	Location of leak	Ft/Meters	0-65535
30149	Modbus Zone68 Status	Bit Level Status	None	0-65535
30150	Modbus Zone68 Distance	Location of leak	Ft/Meters	0-65535
30151	Modbus Zone69 Status	Bit Level Status	None	0-65535
30152	Modbus Zone69 Distance	Location of leak	Ft/Meters	0-65535
30153	Modbus Zone70 Status	Bit Level Status	None	0-65535
30154	Modbus Zone70 Distance	Location of leak	Ft/Meters	0-65535
30155	Modbus Zone71 Status	Bit Level Status	None	0-65535
30156	Modbus Zone71 Distance	Location of leak	Ft/Meters	0-65535
30157	Modbus Zone72 Status	Bit Level Status	None	0-65535
30158	Modbus Zone72 Distance	Location of leak	Ft/Meters	0-65535
30159	Modbus Zone73 Status	Bit Level Status	None	0-65535
30160	Modbus Zone73 Distance	Location of leak	Ft/Meters	0-65535
30161	Modbus Zone74 Status	Bit Level Status	None	0-65535
30162	Modbus Zone74 Distance	Location of leak	Ft/Meters	0-65535
30163	Modbus Zone75 Status	Bit Level Status	None	0-65535
30164	Modbus Zone75 Distance	Location of leak	Ft/Meters	0-65535
30165	Modbus Zone76 Status	Bit Level Status	None	0-65535
30166	Modbus Zone76 Distance	Location of leak	Ft/Meters	0-65535
30167	Modbus Zone77 Status	Bit Level Status	None	0-65535
30168	Modbus Zone77 Distance	Location of leak	Ft/Meters	0-65535

Table 6.5 Input Registers (continued)

Register	Name	Description	Units	Range
30169	Modbus Zone78 Status	Bit Level Status	None	0-65535
30170	Modbus Zone78 Distance	Location of leak	Ft/Meters	0-65535
30171	Modbus Zone79 Status	Bit Level Status	None	0-65535
30172	Modbus Zone79 Distance	Location of leak	Ft/Meters	0-65535
30173	Modbus Zone80 Status	Bit Level Status	None	0-65535
30174	Modbus Zone80 Distance	Location of leak	Ft/Meters	0-65535
30175	Modbus Zone Enabled Flags (00=Modbus Zone 81… 15=Modbus Zone 96)	Bit Level Status Modbus Zone 81 through Modbus Zone 96	None	0-65535
30176	Modbus Zone81 Status	Bit Level Status	None	0-65535
30177	Modbus Zone81 Distance	Location of leak	Ft/Meters	0-65535
30178	Modbus Zone82 Status	Bit Level Status	None	0-65535
30179	Modbus Zone82 Distance	Location of leak	Ft/Meters	0-65535
30180	Modbus Zone83 Status	Bit Level Status	None	0-65535
30181	Modbus Zone83 Distance	Location of leak	Ft/Meters	0-65535
30182	Modbus Zone84 Status	Bit Level Status	None	0-65535
30183	Modbus Zone84 Distance	Location of leak	Ft/Meters	0-65535
30184	Modbus Zone85 Status	Bit Level Status	None	0-65535
30185	Modbus Zone85 Distance	Location of leak	Ft/Meters	0-65535
30186	Modbus Zone86 Status	Bit Level Status	None	0-65535
30187	Modbus Zone86 Distance	Location of leak	Ft/Meters	0-65535
30188	Modbus Zone87 Status	Bit Level Status	None	0-65535
30189	Modbus Zone87 Distance	Location of leak	Ft/Meters	0-65535
30190	Modbus Zone88 Status	Bit Level Status	None	0-65535
30191	Modbus Zone88 Distance	Location of leak	Ft/Meters	0-65535
30192	Modbus Zone89 Status	Bit Level Status	None	0-65535
30193	Modbus Zone89 Distance	Location of leak	Ft/Meters	0-65535
30194	Modbus Zone90 Status	Bit Level Status	None	0-65535
30195	Modbus Zone90 Distance	Location of leak	Ft/Meters	0-65535
30196	Modbus Zone91 Status	Bit Level Status	None	0-65535
30197	Modbus Zone91 Distance	Location of leak	Ft/Meters	0-65535
30198	Modbus Zone92 Status	Bit Level Status	None	0-65535
30199	Modbus Zone92 Distance	Location of leak	Ft/Meters	0-65535
30200	Modbus Zone93 Status	Bit Level Status	None	0-65535

Table 6.5 Input Registers (continued)

Register	Name	Description	Units	Range
30201	Modbus Zone93 Distance	Location of leak	Ft/Meters	0-65535
30202	Modbus Zone94 Status	Bit Level Status	None	0-65535
30203	Modbus Zone94 Distance	Location of leak	Ft/Meters	0-65535
30204	Modbus Zone95 Status	Bit Level Status	None	0-65535
30205	Modbus Zone95 Distance	Location of leak	Ft/Meters	0-65535
30206	Modbus Zone96 Status	Bit Level Status	None	0-65535
30207	Modbus Zone96 Distance	Location of leak	Ft/Meters	0-65535
30208	Modbus Zone Enabled Flags (00=Modbus Zone 97… 15=Modbus Zone 112)	Bit Level Status Modbus Zone 97 through Modbus Zone 112	None	0-65535
30209	Modbus Zone97 Status	Bit Level Status	None	0-65535
30210	Modbus Zone97 Distance	Location of leak	Ft/Meters	0-65535
30211	Modbus Zone98 Status	Bit Level Status	None	0-65535
30212	Modbus Zone98 Distance	Location of leak	Ft/Meters	0-65535
30213	Modbus Zone99 Status	Bit Level Status	None	0-65535
30214	Modbus Zone99 Distance	Location of leak	Ft/Meters	0-65535
30215	Modbus Zone100 Status	Bit Level Status	None	0-65535
30216	Modbus Zone100 Distance	Location of leak	Ft/Meters	0-65535
30217	Modbus Zone101 Status	Bit Level Status	None	0-65535
30218	Modbus Zone101 Distance	Location of leak	Ft/Meters	0-65535
30219	Modbus Zone102 Status	Bit Level Status	None	0-65535
30220	Modbus Zone102 Distance	Location of leak	Ft/Meters	0-65535
30221	Modbus Zone103 Status	Bit Level Status	None	0-65535
30222	Modbus Zone103 Distance	Location of leak	Ft/Meters	0-65535
30223	Modbus Zone104 Status	Bit Level Status	None	0-65535
30224	Modbus Zone104 Distance	Location of leak	Ft/Meters	0-65535
30225	Modbus Zone105 Status	Bit Level Status	None	0-65535
30226	Modbus Zone105 Distance	Location of leak	Ft/Meters	0-65535
30227	Modbus Zone106 Status	Bit Level Status	None	0-65535
30228	Modbus Zone106 Distance	Location of leak	Ft/Meters	0-65535
30229	Modbus Zone107 Status	Bit Level Status	None	0-65535
30230	Modbus Zone107 Distance	Location of leak	Ft/Meters	0-65535
30231	Modbus Zone108 Status	Bit Level Status	None	0-65535
30232	Modbus Zone108 Distance	Location of leak	Ft/Meters	0-65535

Table 6.5 Input Registers (continued)

Register	Name	Description	Units	Range
30233	Modbus Zone109 Status	Bit Level Status	None	0-65535
30234	Modbus Zone109 Distance	Location of leak	Ft/Meters	0-65535
30235	Modbus Zone110 Status	Bit Level Status	None	0-65535
30236	Modbus Zone110 Distance	Location of leak	Ft/Meters	0-65535
30237	Modbus Zone111 Status	Bit Level Status	None	0-65535
30238	Modbus Zone111 Distance	Location of leak	Ft/Meters	0-65535
30239	Modbus Zone112 Status	Bit Level Status	None	0-65535
30240	Modbus Zone112 Distance	Location of leak	Ft/Meters	0-65535
30241	Modbus Zone Enabled Flags (00=Modbus Zone 113… 15=Modbus Zone 128)	Bit Level Status Modbus Zone 113 through Modbus Zone 128	None	0-65535
30242	Modbus Zone113 Status	Bit Level Status	None	0-65535
30243	Modbus Zone113 Distance	Location of leak	Ft/Meters	0-65535
30244	Modbus Zone114 Status	Bit Level Status	None	0-65535
30245	Modbus Zone114 Distance	Location of leak	Ft/Meters	0-65535
30246	Modbus Zone115 Status	Bit Level Status	None	0-65535
30247	Modbus Zone115 Distance	Location of leak	Ft/Meters	0-65535
30248	Modbus Zone116 Status	Bit Level Status	None	0-65535
30249	Modbus Zone116 Distance	Location of leak	Ft/Meters	0-65535
30250	Modbus Zone117 Status	Bit Level Status	None	0-65535
30251	Modbus Zone117 Distance	Location of leak	Ft/Meters	0-65535
30252	Modbus Zone118 Status	Bit Level Status	None	0-65535
30253	Modbus Zone118 Distance	Location of leak	Ft/Meters	0-65535
30254	Modbus Zone119 Status	Bit Level Status	None	0-65535
30255	Modbus Zone119 Distance	Location of leak	Ft/Meters	0-65535
30256	Modbus Zone120 Status	Bit Level Status	None	0-65535
30257	Modbus Zone120 Distance	Location of leak	Ft/Meters	0-65535
30258	Modbus Zone121 Status	Bit Level Status	None	0-65535
30259	Modbus Zone121 Distance	Location of leak	Ft/Meters	0-65535
30260	Modbus Zone122 Status	Bit Level Status	None	0-65535
30261	Modbus Zone122 Distance	Location of leak	Ft/Meters	0-65535
30262	Modbus Zone123 Status	Bit Level Status	None	0-65535
30263	Modbus Zone123 Distance	Location of leak	Ft/Meters	0-65535
30264	Modbus Zone124 Status	Bit Level Status	None	0-65535

Table 6.5 Input Registers (continued)

Register	Name	Description	Units	Range
30265	Modbus Zone124 Distance	Location of leak	Ft/Meters	0-65535
30266	Modbus Zone125 Status	Bit Level Status	None	0-65535
30267	Modbus Zone125 Distance	Location of leak	Ft/Meters	0-65535
30268	Modbus Zone126 Status	Bit Level Status	None	0-65535
30269	Modbus Zone126 Distance	Location of leak	Ft/Meters	0-65535
30270	Modbus Zone127 Status	Bit Level Status	None	0-65535
30271	Modbus Zone127 Distance	Location of leak	Ft/Meters	0-65535
30272	Modbus Zone128 Status	Bit Level Status	None	0-65535
30273	Modbus Zone128 Distance	Location of leak	Ft/Meters	0-65535

Table 6.6 Status Flags (Register 30013 - 30273)

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

Table 6.7 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

Table 6.7 Status Flags (Register 30010) (continued)

Bit	Description
13	1 = Zone14
14	1 = Zone15
15	1 = Zone16

Table 6.8 Status Flags (Register 30011)

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

6.2.3 Function 06: Preset Single Register

To set a parameter value, the primary 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 6.9 Preset Single Register Packet Structure

Read Register Request Packet	Read Registers Response Packet
Secondary Address (1 byte)	Secondary Address (1 byte)
06 (Function code) (1 byte)	06 (Function code) (1 byte)
Register (2 bytes)	Register (2 bytes)
Data (2 bytes)	Data (2 bytes)
Crc Checksum (2 bytes)	Crc Checksum (2 bytes)

6.2.4 Function 16: Preset Multiple Registers

To set multiple parameter values, the primary 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 6.10 Preset Multiple Registers Packet Structure

Read Register Request Packet	Read Registers Response Packet
Secondary Address (1 byte)	Secondary Address (1 byte)
16 (Function code) (1 byte)	16 (Function code) (1 byte)
Start Register (2 bytes)	Start Register (2 bytes)
# of registers to write (2 bytes)	# of registers (2 bytes)
Byte count (1 byte)	CRC Checksum (2 bytes)
Data (2 bytes)	
...	
...	
Crc Checksum (2 bytes)	

6.3 RTU Framing

The following is a typical Query/Response from Vertiv™ Liebert® Liqui-tect™.

Table 6.11 Query Sample

Secondary Address	Function Code	Starting Register "Msb"	StartingRegister "Lsb"	Number of Registers "Lsb"	Number of Registers "Lsb"	CRC 16 "Lsb"	CRC "Msb"
02	04	00	00	00	03	B5	A3

Table 6.12 Response Sample

Secondary Address	Function Code	Count Bytes of Data	Register Data		Register Data		Register Data		CRC16 "LSB"	CRC 126 "MSB
			Msb	Lsb	Msb	Lsb	Msb	Lsb		
02	04	06	00	00	00	00	00	01	B5	A3

Secondary 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)

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7 Preventive Maintenance

Monthly, perform the following system test to verify proper function of the Vertiv™ Liebert® Liqui-tect™ control panel.

1. Place a clean, damp cloth or paper towel on the cable, and verify that the leak is detected on the control panel.
2. Using a reference map (if available), verify that the correct leak location displays.
3. See Calibrating Resistance to Cable Length on page 11 if necessary.
4. Dry the cable and verify that operation returns to normal.
5. Remove the end terminator from the end of the cable run, and verify that a cable-break alarm displays on the control panel.
6. Reinstall the end terminator, and verify that operation returns to normal.
7. Monitor the cable current monthly to verify that the cable is not contaminated. The cable-contamination alarm displays if contamination is excessive.
8. Log-in to the web UI, and verify that the Cable Current is less than 15 µA.
    - If current is greater than 15 µA, troubleshoot the cables to determine which is contaminated. Remove the contaminated cable, clean and test it before re-installing.

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8 Troubleshooting

The following table lists problems that you may encounter with the Vertiv™ Liebert® Liqui-tect™ system, and action to take to resolve them. For all other troubleshooting questions or concerns, contact us at one of the following:

Telephone: 800-222-5877 option 2, Outside the US: 614-841-6755

E-mail: Liebert.monitoring@vertiv.com

Table 8.1 Troubleshooting the System

Problem	Action
Control panel does not power-on	Using a DVOM (multi-meter), check for AC and DC input power on the lower, left-hand terminal block on the controller. If no voltage is present, check the circuit breaker or power supply that powers the controller. • If voltage is present at the circuit breaker/power supply, contact technical support for unit evaluation/replacement.
Incorrect display on LCD display	• Open the front door of the unit and verify that the connectors that link J2 of the control board to J4 on the display board are firmly connected and that the wires are undamaged. • Update the LCD-display firmware. See Updating LCD Display Firmware on page 51.

Cable-break alarm	• Verify that the leader from the leak-detection cable is plugged into the terminal block marked "Cable."
	• Verify that the end terminator is installed at the end of the leak-detection cable run.
	• If the end terminator is present, remove it from the end of the run and install it on the end of the leader cable from the control panel.
	• If the alarm clears, there is a damaged/faulty section in the leak-detection cable.
	  • To find the damaged/faulty section, move the end terminator to the end of each section of leak-detection cable.
	• If the alarm does not clear, power-off the control panel, and remove the terminal block marked "cable" from the controller.
	  • Remove the 4 conductors from the leader-cable wire connected to the 4-position terminal block.
	  • Install a jumper wire between pins 1 and 2, and another between pins 3 and 4.
	  • Re-install the terminal block.
	  • If the alarm condition clears, the leader cable is the problem. Contact technical support.

Table 8.1 Troubleshooting the System (continued)

Problem	Action
Incorrect length-of-cable reported	• Verify proper wiring to the terminal block marked "Cable." See Connecting Power to Vertiv™ Liebert® Liqui-tect™ on page 11 for correct wiring. • Calibrate the cable. See Calibrating Resistance to Cable Length on page 11 . • If the problem persists, contact technical support.

Incorrect distance to leak reported	• Check the distance on the cable run to verify that the control panel is monitoring.
	• Verify that there is no water along the cable run. If water is found:
	  • Check for multiple leaks along the cable. The first leak should be read and latched. However, if the system is updated or if two or more simultaneous leaks occur within 30 seconds of the initial leak, the system may display the average distance to the leak (distance to first + distance to second/2),
	• If no water is found, check the cable as follows:
	  • Power-off the control panel and remove the end terminator from the end of the leak-detection cable.
	  • Locate the first section of leak-detection cable, disconnect it from the second leak-detection cable, and install the end terminator to the end of the first section.
	  • Power-on the controller and let it run for 5 to 10 minutes, then place a damp cloth on the leak-detection cable.
	  • If the test leak is correctly detected, remove the end terminator, re-connect the sections and move to the end of the next section to repeat the test until the faulty section is found.
	• If the fault reading is on the first cable section, the miscalculations may be in the controller. Contact technical support.

Cable-contamination alarm	Remove and clean the leak-detection cable using a clean damp rag. • If contaminated by oil, glycol, or chemicals, make a solution of 1 cap full of mild detergent mixed in 2 gallons of lukewarm water (<105°F). In a suitable container, gently agitate the cable in the solution, then rinse the cable with clear, lukewarm water. Wipe the cable dry with a clean towel. • You may also clean the cable by wiping it with isopropyl alcohol. Test the cable before re-installing it.

The following table lists questions that you may encounter with the Vertiv™ Liebert® Liqui-tect™ leak-detection cable, and answers to the questions. For all other troubleshooting questions or concerns, contact us at one of the following:

Telephone: 800-222-5877 option 2, Outside the US: 614-841-6755

E-mail: Liebert.monitoring@vertiv.com

Table 8.2 Troubleshooting the Leak-Detection Cable

Question	Answer
The leak-detection cable touches metal surfaces. Is this a problem or a potential problem?	In general, touching metal is not a problem. The sensing wires are covered with a non-conductive polymer weave that isolates the cable from metal surfaces. However, as with all cabling and electrical wires, avoid sharp objects that could pierce the insulation and polymer weave.
The leak-detection cable is routed so that it crosses over itself. Can this cause false alarms?	Crossing the leak-detection cable will not cause false alarms, but it may cause false distance readings if a leak occurs where the cable crosses over. If the leak-detection cable must cross, use a jumper cable to "jump over" the sensing cable.
If I suspect a bad section of leak-detection cable, how can I verify that it is bad without returning it to the factory for evaluation?	Because it can be very difficult to remove installed leak-detection cabling, confirm that there is a problem using the "Incorrect distance to leak reported on the previous page " solution in the system-troubleshooting table.
How do I secure the sensing cable to the floor?	We recommend securing the cable with factory-provided hold-down clips. See Laying the Leak-Detection Cable and Securing to the Floor on page 7 for the correct method of securing the cable.
How do I clean the cable?	If only a small section of the cable needs cleaned, wipe the contaminated section with isopropyl alcohol. To clean the entire cable, refer to the solution steps for Cable-contamination alarm on the previous page in the system-troubleshooting table.
My system shows a leak detected, but there is no leak found at the reported location. The alarm condition will not clear.	The most common causes for a constant alarm condition are: 1. Water is touching the cable in two places at the same time. • Check for multiple leaks along the cable. The first leak should be read and latched. However, if the system is updated or if two or more simultaneous leaks occur within 30 seconds of the initial leak, the system may display the average distance to the leak (distance to first + distance to second/2). • Displaying an average distance occurs if the operator resets the system without recording the first leak-location displayed. Check the alarm history for the first incidence of a leak. 2. The cable is exposed to high humidity, or the dew point has been reached in the facility. This is common when two or more air conditioners share the same under-floor space. • Although more easily said than done (especially if the air conditioners are working properly), one option is to correct the "over cooling" that causes moisture or condensation on the leak-detection cable. • At the controller, adjust the system to its least-sensitive setting to prevent the system from alarming. This does not correct the "over cooling" problem. • Move the cable at least 10 ft from the air-conditioner discharge air flow. • Cover the leak-detection cable that is in from of the air-conditioner discharge air flow with spiral wrap, a plastic covering that allows water to reach the cable but prevents condensation on the cable. 3. The cable is chemically contaminated (floor-sealing chemicals dissolve and damage the cable) or physically contaminated (metallic chips from filings or solder from piping or wiring installation). The cable must be replaced. 4. The cable is damaged, most often from dropping a floor tile on it. The damaged cable must be repaired or replaced.

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