



User Guide

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1.0 Introduction

The purpose of this User Guide is to describe the operation of a LevelSender telemetry system, including programming, installation, and data collection.

LevelSender telemetry is a simple, low cost system designed to wirelessly send data from Solinst dataloggers in the field, via GSM cellular communication, to multiple emails, an SMS (text) recipient, as well as the “Home Station” PC.

Initial setup for each LevelSender remote station is done using the LevelSender PC Software Utility and a USB connection. Each LevelSender is programmed with a “Sampling Rate”, the rate at which the LevelSender collects data from the attached datalogger(s), and a “Reporting Rate”, the rate at which the LevelSender reports the collected data via email and SMS.

With each report, data is sent as text to the email and SMS recipients. Data is automatically saved to a SQLite database on the Home Station PC, which the user can access for use in their own customized database. Data can also be imported by LevelSender Software at the Home Station, where emails can be viewed and saved as files, and data exported as *.xle files for use in Levellogger Software.

Changes to the sampling and reporting schedule can be done directly through a USB cable and the LevelSender Software. Alternatively, remote schedule changes can be sent to individual LevelSender stations using the LevelSender Software (via email).

1.1 Compatibility

Each LevelSender station can connect up to two Solinst dataloggers (using a splitter). LevelSender telemetry is compatible with the Levellogger Edge, Barologger Edge, Levellogger Junior Edge, Rainlogger Edge, as well as the Levellogger Gold, Barologger Gold, Levellogger Junior, LTC Levellogger Junior and Rainlogger dataloggers using the following firmware versions:

Datalogger	Firmware Version
Levellogger Edge	3.003
Barologger Edge	3.003
Levellogger Junior Edge	3.003
Rainlogger Edge	3.001
Levellogger Gold	2.007
Barologger Gold	2.007
Levellogger Junior	2.007
LTC Levellogger Junior	2.005
Rainlogger	2.000

Table 1-1 Compatible Datalogger Firmware Versions

Note: See the Levellogger User Guide for more information on the Levellogger Series of dataloggers.

It is also important to ensure you are using the most recent LevelSender firmware version, with the most recent LevelSender Software. To check this, go to www.solinst.com/downloads/

Note: To determine what firmware version your LevelSender is using, you can check using LevelSender Software, see Section 3.4.

2.0 LevelSender Overview

The LevelSender is a simple, low cost device designed to wirelessly send data from Solinst dataloggers in the field, via GSM cellular communication, to a Home Station PC, multiple emails and/or an SMS cellular phone number.

2.1 LevelSender Remote Stations

LevelSender remote stations are designed to be placed in a 2" diameter well (4" with adaptor), but can also be used in other applications. Each Level Sender comes with a 2" Well Cap Assembly and a Support Hanger Bracket (see Section 6 for installation instructions). LevelSender stations are constructed from PVC, and have an IP rating of 64 (dust and splash proof).

Each station includes a built-in GSM radio module, an antenna, and an LED that flashes with operation. There is a USB connection for programming the LevelSender using the LevelSender PC Software, a compartment for three 1.5V AA replaceable lithium batteries, and a SIM card slot.

Each LevelSender station can connect up to two dataloggers (using a splitter).

Note: Mini USB Cable for programming the LevelSender, and Reader Cables and Direct Read Cables to connect to Levelloggers are available separately.



Figure 2-1 LevelSender Station

LevelSender Specifications	
Materials:	PVC, 316 stainless steel
IP Rating:	IP64 (dust and splash proof)
Operating Temperature:	-20°C to 60°C
Size:	2.5" x 9.375" (with antenna folded down)
Weight:	16.9 oz. (478 grams)
Batteries:	3 x 1.5V AA replaceable lithium batteries (alkaline can also be used)
Antenna:	SMA Male Monopole 2dBi
Modem:	Cellular GSM

Table 2-1 LevelSender Specifications

2.1.1 LED Light Identification

- ☉ LevelSender is awake and performing a task.
- ☹ Startup LED is solid green, then off. If there is an error, the LED will flash red three times.

2.1.2 LevelSender Antenna

The Level Sender comes with a SMA male monopole 2dBi antenna. To attach the antenna, simply line up the connector and screw it onto the connection on the top of the LevelSender. The antenna bends to accommodate well cap installation.

The antenna for the LevelSender uses an SMA connection, therefore, you can source other antennas with an SMA male connector, if required.



Figure 2-2 LevelSender Antenna

2.2 Wireless Carrier Requirements

Note: The LevelSender system supports using dynamic IPs for the Home Station and the remote LevelSender stations.

LevelSender operation requires setting up a cellular account with a wireless carrier. They will provide you with the information required to set up your LevelSender.

Request a data usage service plan for a GSM network. You do not require voice access or voice features.

Your cellular service provider will give to you an activated SIM card, APN (Access Point Name), account type, user name, and password.

Note: You will also require an email account dedicated to sending and receiving emails at the Home Station, as well as separate, unique email addresses for each LevelSender station. This can be set-up on your own, or with the help of your IT department.

2.2.1 Installing the SIM Card

Note: The LevelSender uses a standard size SIM card (15 mm x 25 mm).

To install the SIM Card:

1. Use a Phillips screwdriver to remove the three screws from the top of the LevelSender.
2. Gently pull off the top cap of the LevelSender. Be careful not to pull the antenna wire more than a few inches out from the top of the LevelSender.
3. Insert the SIM card into the slot on the top of the LevelSender, as shown in the photo below.

Note: To remove the SIM card, press down on the card and it will spring up and out of the slot.

4. While lowering the LevelSender top cap back into place, carefully push the antenna wire back into the opening.
5. Replace the three screws to secure the top cap.



Figure 2-3 Installing the SIM Card

2.3 LevelSender Batteries

A LevelSender uses three 1.5V AA replaceable lithium batteries to operate. Batteries need to be installed before programming.

Note: Alkaline batteries can also be used, but battery life estimates will be reduced. They may also reduce the operating temperature range.

2.3.1 Installing LevelSender Batteries

To install the batteries:

1. Unscrew the stainless steel cap from the LevelSender to access the battery compartment.
2. Install the three batteries with the positive ends first/down, in the battery compartment.
3. Replace the stainless steel cap.

Note: If you are not using your LevelSender for more than two months, Solinst recommends removing the batteries for long term storage.



Figure 2-4 Installing the Batteries

2.3.2 LevelSender Battery Life Estimates

Sample Rate	Report Rate	Battery Life Estimates	
		One Datalogger Connected	Two Dataloggers Connected
Every Hour	Every Day	4 Years	3.3 Years
Every Hour	Every 6 Hours	1 Year	11 Months
Every 15 Minutes	Every Hour	2 Months	1.8 Months

Table 2-2 LevelSender Battery Life Estimates

Note: Estimates are based on three 1.5V AA lithium batteries.

Note: The LevelSender will use battery power each time it samples, reports, and checks for updates. As such, more frequent intervals will drain the battery more quickly.

2.4 Connecting Dataloggers

Each LevelSender has a single port to connect one datalogger. An optional splitter allows the connection of a second datalogger. Levelloggers are connected to the LevelSender using a 3 foot long Reader Cable connected to the Levellogger's Direct Read Cable.

To connect a Reader Cable to the LevelSender station, remove the black dust cap from the connection on the LevelSender, line up the holes in the connectors, push the Reader Cable connector into the connection on the LevelSender and screw the Reader Cable into the LevelSender until finger-tight. Connect the other end of the Reader Cable to the top end of the Levellogger's Direct Read Cable.

Note: See the Levellogger User Guide for more information on connecting Direct Read Cables to your Levelloggers.



Figure 2-5 Connecting Levelloggers

2.4.1 Splitters

Splitters allow the connection of two dataloggers to each LevelSender. To connect a Splitter to the LevelSender, remove the black dust cap, line up the holes in the connectors, and screw the Splitter into the LevelSender connection until finger-tight. Reader Cables are connected to the Splitters in the same manner they are connected directly to the LevelSender.



Figure 2-6 Connecting Splitters

Note: When using a Splitter, the number 1 or 2 will identify the Dataloggers in LevelSender Software. The numbers are labeled directly on the Splitter.

3.0 LevelSender Software

The LevelSender PC Software provides an easy-to-use graphical interface to configure the Home Station email, program LevelSender remote stations with cellular settings, data sampling and reporting schedules, and set up email addresses and/or an SMS contact to receive the data.

LevelSender Software can be used to program a LevelSender directly through a USB cable; in addition, a LevelSender email address is set up in the software for each LevelSender station, which is used to remotely receive data schedule changes.

LevelSender Software can also be used to receive data at the Home Station, and export it for use in other programs, including Levellogger PC Software for data compensation.

Note: Data files are also automatically saved on the Home Station PC as a back-up (see Section 5.3).

The software can also perform communication tests between the Home Station and a remote LevelSender station, and between a remote LevelSender station and the connected datalogger(s). It can also perform diagnostic tests on a USB connected LevelSender station.

Note: LevelSender Software Version 1.0.0 is compatible with LevelSender Firmware Version 1.000.

3.1 System Requirements

The minimal hardware and software requirements for LevelSender PC Software installation and operation are:

Hardware	Software
1 GHz Processor	Windows 7, 8, or 10
1 GB RAM	
2 GB available disk space	
USB and Internet connections	

Table 3-1 System Requirements

Note: You will also require an email account dedicated to sending and receiving emails at the Home Station, as well as separate, unique email addresses for each LevelSender station. .

3.2 Software Installation

Download the newest version of LevelSender Software by visiting:
www.solinst.com/downloads/

After opening the setup.exe file, the Software Installation Wizard will guide you through the installation process.

Default Directory is <C:\Program Files\Solinst\LevelSender>

3.3 LevelSender Software Communication

For initial setup and direct communication with LevelSender PC Software, the LevelSender must be connected to the PC using a mini USB cable (available from Solinst).


To access the USB connection on the LevelSender:

1. Use a Phillips screwdriver to remove the three screws from the top of the LevelSender.
2. Gently pull off the top cap of the LevelSender. Be careful not to pull the antenna wire more than a few inches out from the top of the LevelSender.
3. Connect the USB cable to the mini USB connection in the LevelSender.
4. When finished communicating with the PC Software, unplug the USB cable.
5. While lowering the LevelSender top cap back into place, carefully push the antenna wire back into the opening. Replace the three screws to secure the top cap.



Figure 3-1 USB Cable Connection

3.4 LevelSender Software Main Window

To start the LevelSender Software, click  on your desktop, or click the Start button and select: Programs > Solinst > LevelSender.

The LevelSender Software main window will be displayed. From here you can set up the Home Station email, view LevelSender settings, set up new LevelSender remote stations, edit existing LevelSender settings, and receive and open LevelSender emails and data.

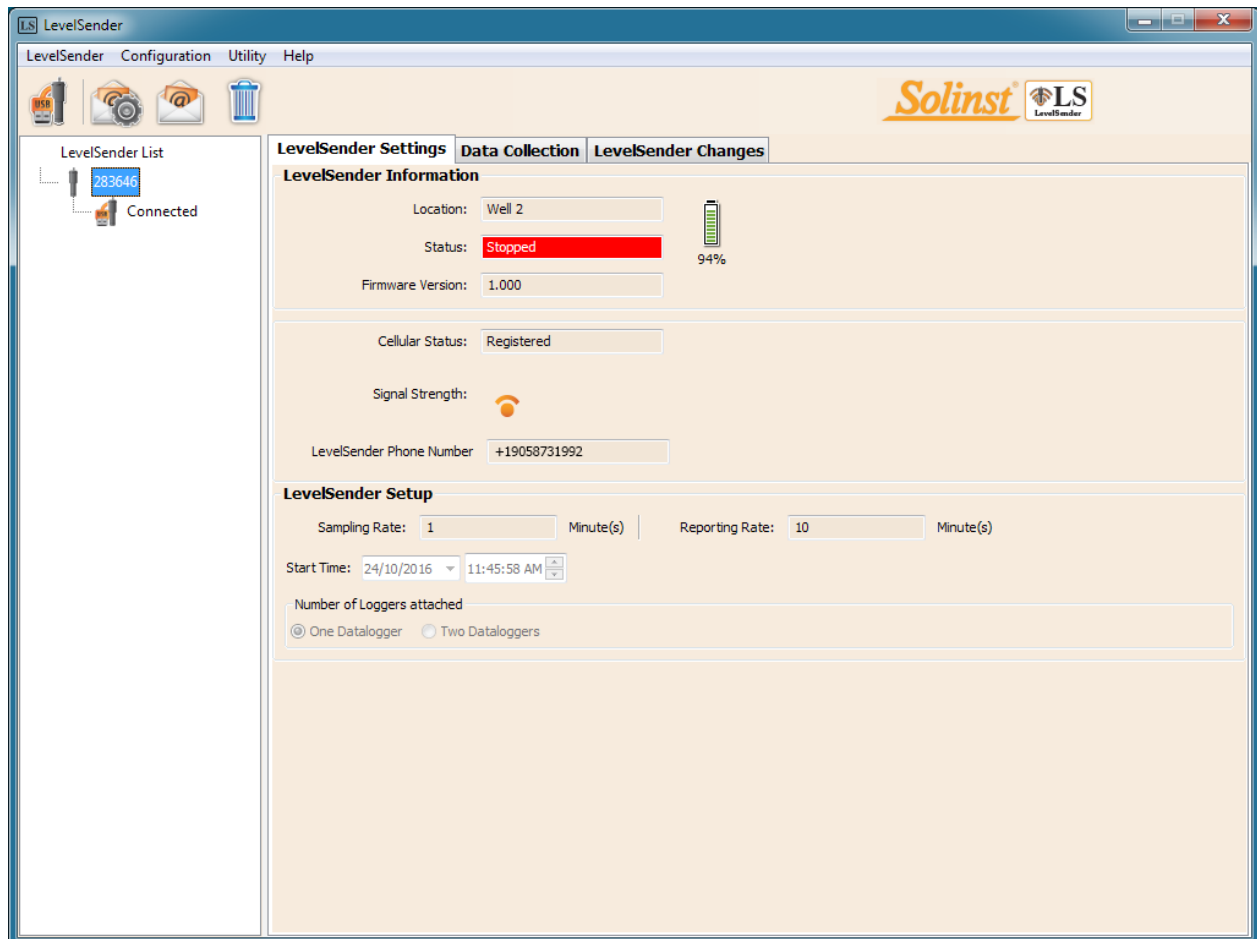



Figure 3-2 LevelSender Settings

If the software is running, connecting a new LevelSender station using the USB cable will automatically start the LevelSender Setup Wizard. See Section 4.2.

The window on the left of the Software lists each programmed LevelSender station  by its serial number. If the LevelSender station is connected to the Home Station PC using a USB cable, it will be identified with “Connected” and an icon  below it.

To delete a LevelSender station, click to highlight it in the list, then click the delete icon  .

3.4.1 LevelSender Software Options

Selecting the serial number of a programmed remote (or connected) LevelSender station  from the list will display the **LevelSender Settings**:

LevelSender Information


- **Location:** specific site / location information that you input to identify each LevelSender station.
- **Status:** the LevelSender will either be “Started” with a previously programmed data collection schedule, “Stopped”, or “Waiting to Start” at a programmed future start time.
- **LevelSender Time:** the real-time, internal clock of the LevelSender.
- **Firmware Version:** the firmware version of the LevelSender station will be displayed.
- **Cellular Status:** the LevelSender will either be “Registered” and properly setup with the wireless carrier, or “Not Registered” – the LevelSender does not have the wireless carrier properly set up, or there is a communication problem with the carrier.
- **Signal Strength:** the signal strength of the LevelSender GSM radio module will be displayed.
- **LevelSender Phone Number:** the phone number associated with your GSM cellular account.

LevelSender Setup

- **Sampling Rate:** the rate that the LevelSender station collects data from the connected datalogger(s).
- **Reporting Rate:** the rate that the LevelSender station reports collected data via email/SMS.
- **Start Time:** the date and time the LevelSender started collecting data (or date and time the LevelSender is programmed to start).
- **Number of Dataloggers Attached:** either one or two dataloggers will be attached.

The **Data Collection** and **LevelSender Changes** tabs will also be available. See Sections 5.3 and 4.3 for the functions of these tabs.

3.4.2 Connected LevelSender Software Options

Selecting “Connected” below a programmed LevelSender  from the list will display the **Mobile Settings**, **Configuration Email Setup**, **Data Reporting Setup**, and **Diagnostic Information** tabs.

The function of the first three tabs is to review the settings that have previously been applied to the connected LevelSender station. See Section 8.1 for an overview of the Diagnostics Information tab.

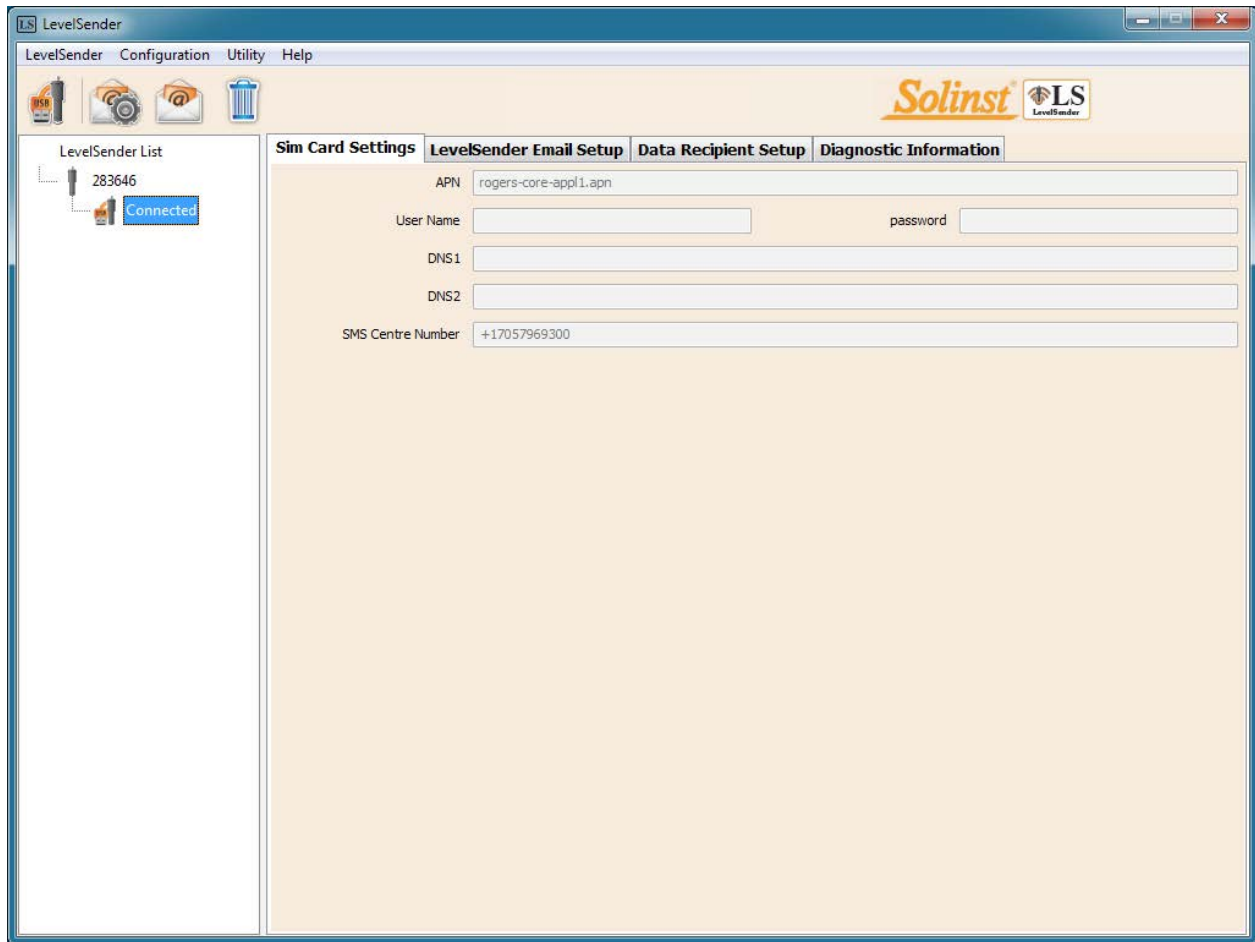


Figure 3-3 Connected LevelSender Tabs

4.0 LevelSender Configuration

4.1 Home Station Email Setup

To enable your Home Station to receive emails and data, and send remote updates, you must set up a Home Station email. Multiple LevelSender stations can report to one Home Station email. It is recommended that a unique, dedicated email address be set up for your Home Station.

Note: The LevelSender system supports using dynamic IPs for the Home Station and the remote LevelSender stations.

To set up an email for your Home Station, click . You can also go to the **Configuration** menu and select **Email Account Configuration**.

Figure 4-1 Home Station Email Account Configuration

Enter the following information:

Note: You may require your IT department to help determine some of the following information.

Note: See the Appendix for Gmail and Yahoo email setup information.

User Information

- **Email Address:** the email address you wish to use for your Home Station to receive data and send remote updates using LevelSender Software.

Mail Server Information

- **Account Type:** the protocol your server uses to receive mail, either POP3 or IMAP.
- **Incoming Mail server:** the name (access domain) of your incoming mail server (e.g. pop.gmail.com).
- **Outgoing Mail server (SMTP):** the name (access domain) of your outgoing mail (SMTP) server (e.g. smtp.gmail.com).

Login Information

- **User Name:** the user name associated with the email account (usually the full email address).
- **Password:** the password used to access the email account.
- **Require login using Secure Password Authentication (SPA):** check this box only if your service provider requires you to. Few service providers use this setting.

Outgoing Server Information

- Enter the security information for your outgoing mail server. Your email service provider may require you to provide more authentication information on the SMTP server.

Server Port Number

- **Incoming server/Outgoing server (SMTP):** the email service provider may require a different server port number for sending and receiving email (e.g. Gmail, See Appendix for more information).
- **Require SSL:** check this box if the email server requires SSL.
- **Encrypted Connection:** the encryption option for the outgoing server (SSL, TLS and AUTO)

Click OK once you are finished entering all of your Home Station email account information.

4.1.1 Checking Home Station Email

Once you have set up your Home Station email, you can test that the settings you entered are correct by clicking



This will open the LevelSender Email Client. The LevelSender Email Client will indicate whether an email was received by the Home Station.

You can access the LevelSender Email Client at any time to view all emails received or sent by the Home Station, including test emails.

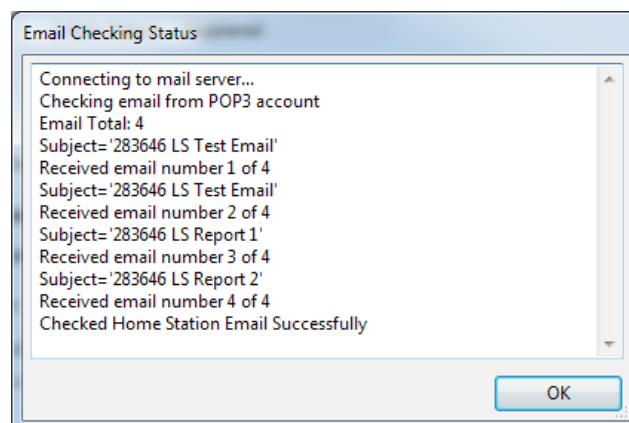


Figure 4-2 LevelSender Email Client

4.2 LevelSender Setup Wizard

Connect your LevelSender station to your PC using the USB cable.

If this is a new LevelSender station, the LevelSender Setup Wizard will automatically start if the LevelSender Software is open, or click  to start the Wizard.

Note: You can only set up one LevelSender station at a time.

4.2.1 Connecting to the LevelSender

Once the connected LevelSender is detected by the Wizard (this may take a few seconds), click **Next** to continue the setup. Click **Cancel** to exit the Wizard at any time.

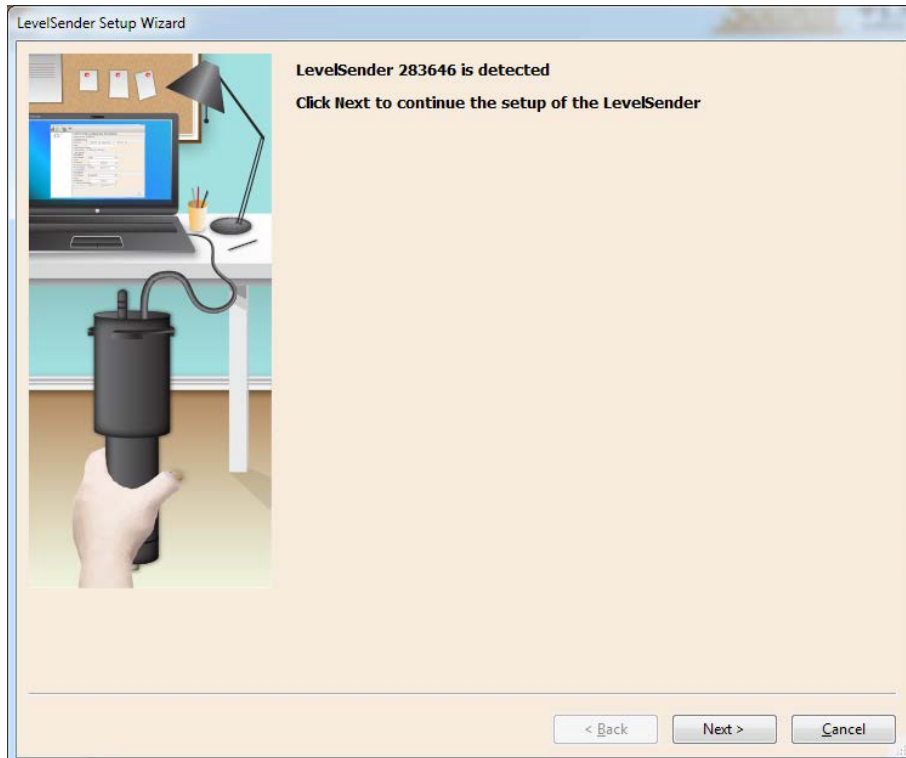


Figure 4-3 LevelSender Detected

4.2.2 SIM Card Settings

In this step enter the following information to set up your wireless GSM network. This information is provided to you by your wireless carrier, and is associated with the SIM card you obtained from the carrier.

APN (Access Point Name): associated with your GSM account, provided by the wireless carrier. Each carrier has their own unique APN (e.g. internet.com).

User Name: the user name for the GSM account.

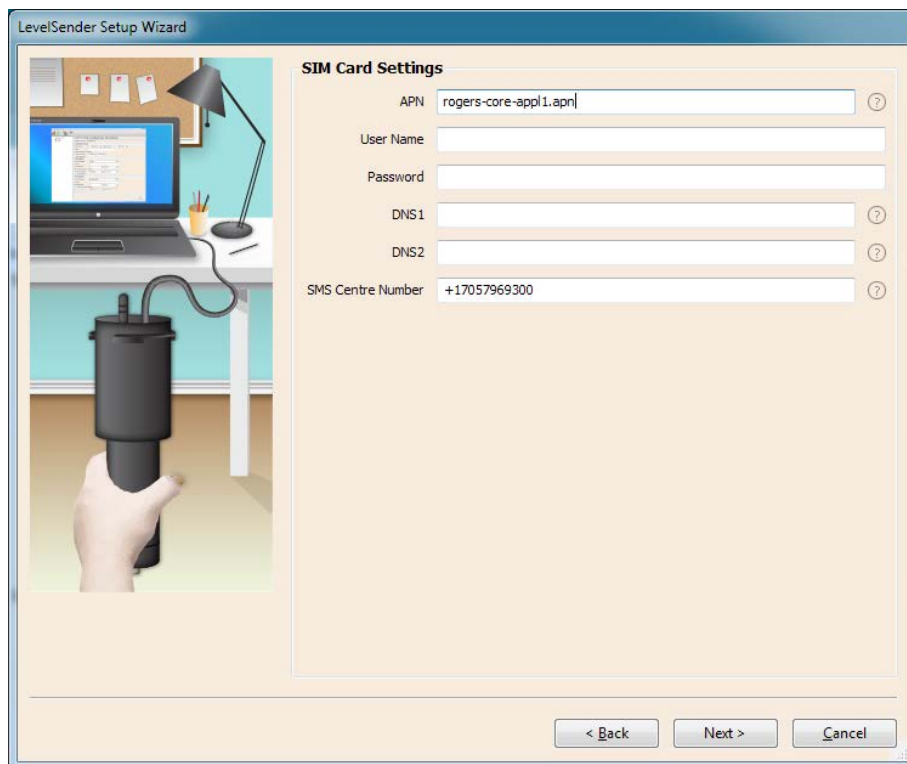
Password: the password that was set for the GSM account.

DNS1/DNS2: the wireless carrier DNS (Domain Name Server) address, e.g. 207.181.101.4.

Note: User Name, Password, and DNS addresses may not be required for your particular service provider (e.g. it may be a public account)

SMS Centre Number: a Short Message Service Centre number is responsible for delivering the SMS text messages from your mobile device network to the destination mobile device network.

Click **Next** to continue the setup.



The screenshot shows the 'LevelSender Setup Wizard' window with the 'SIM Card Settings' tab selected. The window contains several input fields for configuration:

- APN:** A text box containing 'rogers-core-appl1.apn' with a help icon (question mark) to its right.
- User Name:** An empty text box.
- Password:** An empty text box.
- DNS1:** An empty text box with a help icon to its right.
- DNS2:** An empty text box with a help icon to its right.
- SMS Centre Number:** A text box containing '+17057969300' with a help icon to its right.

At the bottom of the window, there are three buttons: '< Back', 'Next >', and 'Cancel'.

Figure 4-4 LevelSender SIM Card Settings

4.2.3 LevelSender Email Setup

In this step you will program the LevelSender with an email address it will use to send data and receive remote updates. It must be different from the Home Station email address. Each LevelSender must have a unique email address.

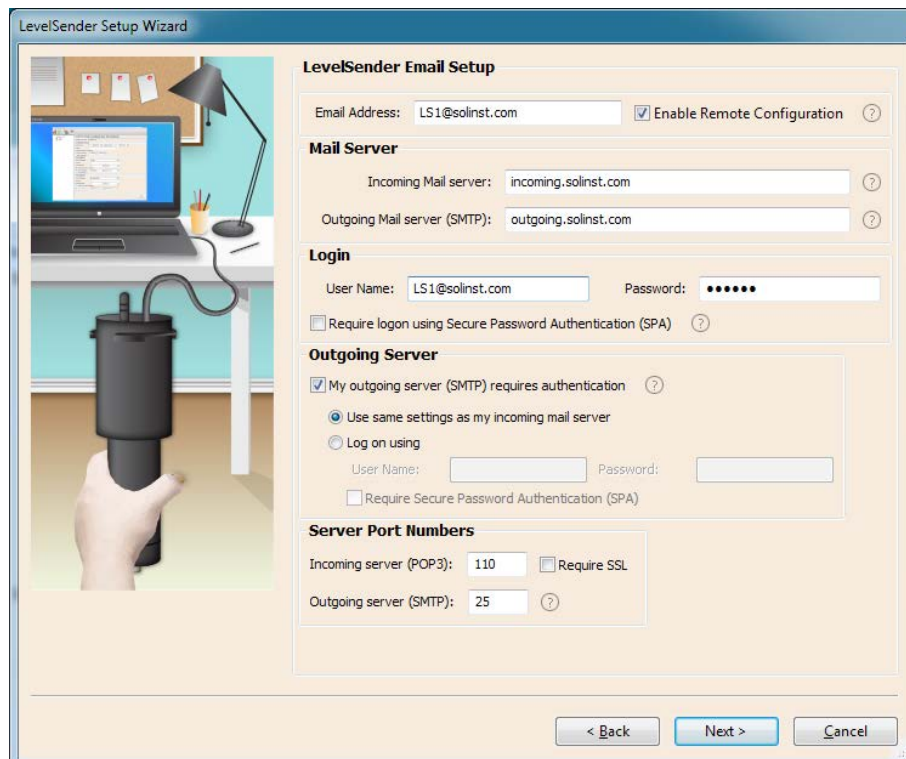
Note: Each LevelSender must have a unique, dedicated email address. Solinst recommends creating a new email address for each LevelSender.

Enter the incoming and outgoing mail server information for the email account, as well as the user name and password associated with the account. See Section 4.1 for a description of each parameter required.

Note: An IMAP account is not supported for the LevelSender email. TLS is also unsupported.

To enable the LevelSender station to receive remote updates from the Home Station, ensure you check **Enable Remote Configuration**.

Click **Next** to continue the setup.



The screenshot shows the 'LevelSender Setup Wizard' dialog box. The title bar reads 'LevelSender Setup Wizard'. The main window is titled 'LevelSender Email Setup'. On the left side, there is a small illustration of a desk with a laptop, a lamp, and a hand holding a black LevelSender device. The right side contains the configuration fields:

- LevelSender Email Setup:** Email Address: LS1@solinst.com; Enable Remote Configuration
- Mail Server:** Incoming Mail server: incoming.solinst.com; Outgoing Mail server (SMTP): outgoing.solinst.com
- Login:** User Name: LS1@solinst.com; Password: [masked]; Require logon using Secure Password Authentication (SPA)
- Outgoing Server:** My outgoing server (SMTP) requires authentication; Use same settings as my incoming mail server; Log on using; User Name: [empty]; Password: [empty]; Require Secure Password Authentication (SPA)
- Server Port Numbers:** Incoming server (POP3): 110; Require SSL; Outgoing server (SMTP): 25

At the bottom of the dialog are three buttons: '< Back', 'Next >', and 'Cancel'.

Figure 4-5 LevelSender Email Setup

Note: To enable the LevelSender station to receive remote updates from the Home Station, ensure you check **Enable Remote Configuration**.

4.2.4 Data Recipient Setup

In this step you will enter the recipients of the data reports sent from the LevelSender station.

Home Station Email: enter the email address that was setup for your Home Station. This allows data to be sent to the Home Station PC database and viewed in LevelSender Software.

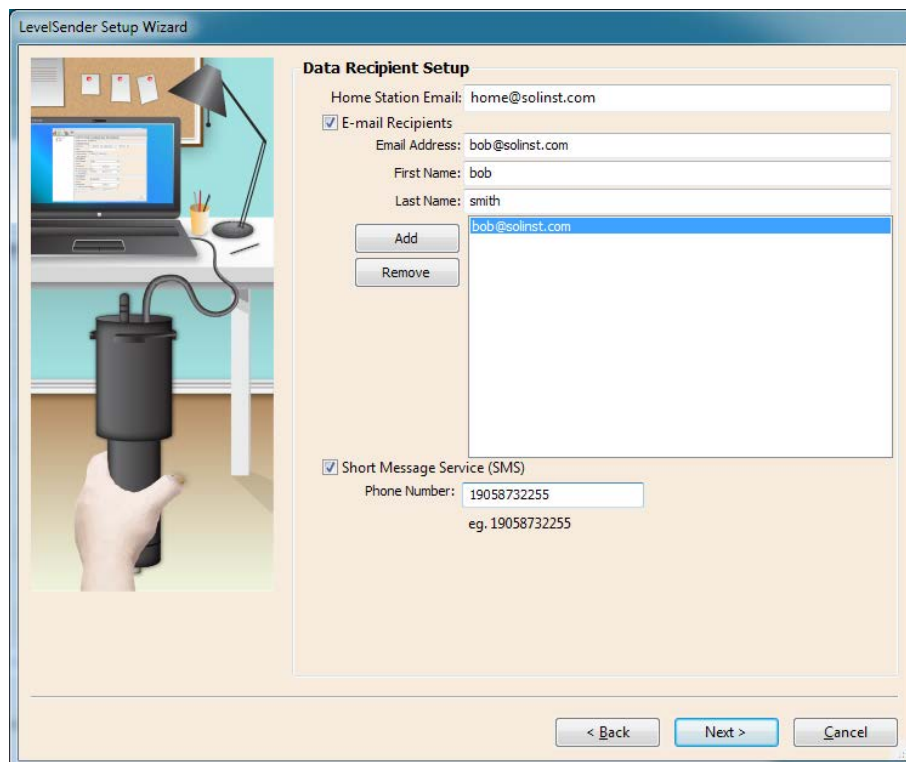
Email Recipients: to add an email recipient, enter the First Name, Last Name, and Email Address of the recipient, then click ADD. You can add up to 5 email addresses.

Note: To remove a recipient from the list, click to highlight it, then click Remove.

Short Message Service (SMS): enter the cellular Phone Number on which to receive text messages containing data. The number must be entered in the following format: 19058732255

Note: If adding an SMS recipient, an unlimited texting plan is recommended for the account associated with the phone number.

Click **Next** to continue the setup.



The screenshot shows the 'LevelSender Setup Wizard' window with the 'Data Recipient Setup' tab selected. The window is divided into two main sections. On the left, there is a vertical image showing a desk with a laptop and a hand holding a black LevelSender device. On the right, the 'Data Recipient Setup' form is displayed. The form includes the following fields and options:

- Home Station Email:** home@solinst.com
- E-mail Recipients**
 - Email Address:** bob@solinst.com
 - First Name:** bob
 - Last Name:** smith
 - Add** button
 - Remove** button
 - A list box containing 'bob@solinst.com' with a blue highlight.
- Short Message Service (SMS)**
 - Phone Number:** 19058732255
 - eg. 19058732255

At the bottom of the window, there are three buttons: '< Back', 'Next >', and 'Cancel'.

Figure 4-6 Data Recipient Setup

Note: Ensure you have added all of the recipients, as you can only make changes to this list when the LevelSender is connected to the PC with the USB cable.

4.2.5 LevelSender Setup

In this step you will set up your LevelSender station Sampling and Reporting Schedule.

- **Location:** enter specific site / location information to identify each LevelSender station.
- **Sampling Rate:** the rate that the LevelSender station collects data from the connected datalogger(s). Sampling Rate can be set from 1 minute to 99 hours.
- **Reporting Rate:** the rate that the LevelSender station reports collected data via email/SMS. Reporting rate can be set from 5 minutes to 99 hours. With each report, the LevelSender will also check for remote updates from the Home Station. Remember to check **Enable Remote Configuration** in Step 3 (Section 4.2.3) of the LevelSender Setup Wizard to allow remote updates from the Home Station.

Note: The LevelSender will use battery power each time it samples, reports, and checks for updates. As such, more frequent intervals will drain the battery more quickly. See Section 2.3.2 for battery life estimates.

- **Start Time:** set a date and time for the LevelSender to start collecting data and send a Report.

Note: If the start time is earlier than the current time, the LevelSender will start immediately.

- **Number of Dataloggers Attached:** select one or two dataloggers.

Note: If you want to set your dataloggers to record simultaneously in their own internal memory as a back-up, this can be done after setting up the LevelSender station, and going to the LevelSender Changes tab (Section 4.3). You can also use Levellogger Software to program and start your dataloggers.

Click **Next** to continue the setup.

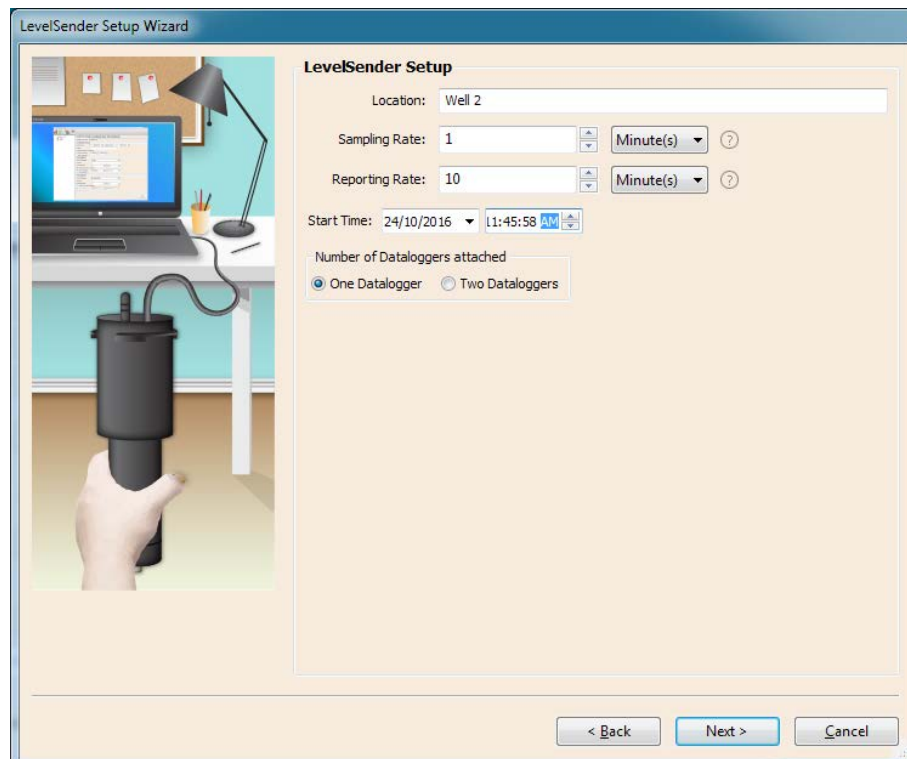


Figure 4-7 LevelSender Setup

4.2.6 Pre-Start Diagnostics

The Pre-Start Diagnostic tests are done automatically when you reach this step.

Test LevelSender Battery: this test will fail if the LevelSender battery is below 2.5 volts.

Test Mobile Connection: checks if the LevelSender is connected to the mobile carrier. The possible causes of failure are: improperly inserted SIM Card, low signal strength or power failure.

Send Test Email: Sends a test email through the LevelSender email to the Home Station and recipients.

Test Datalogger: tests the communication on the attached datalogger(s).

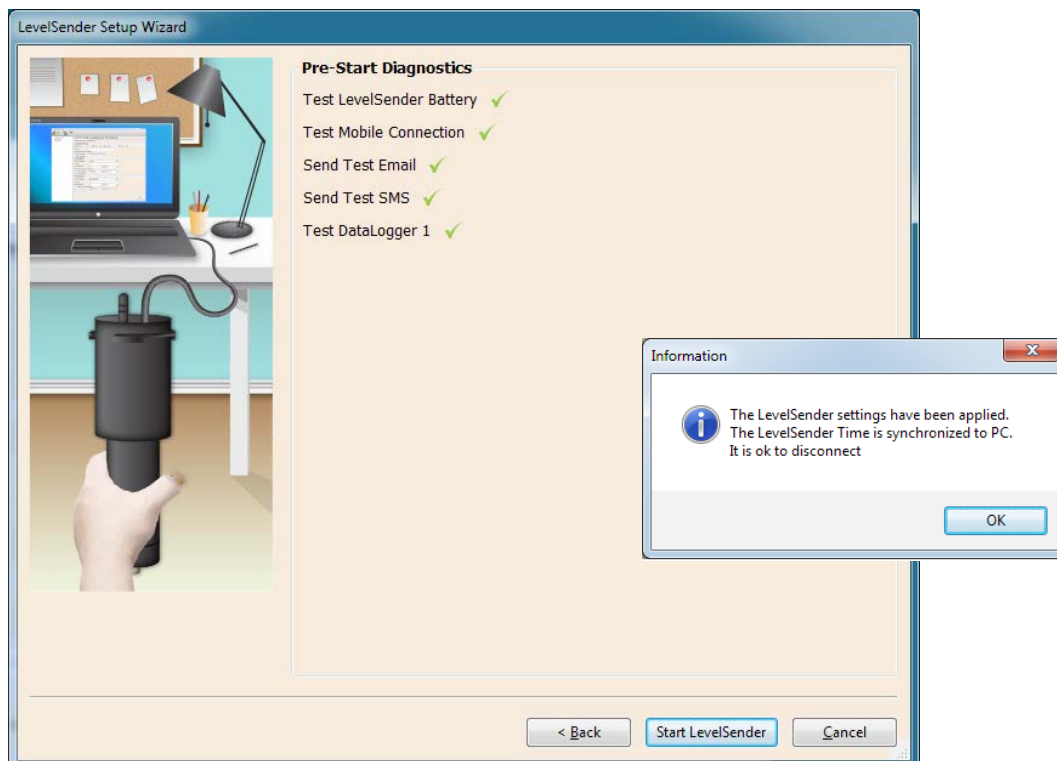


Figure 4-8 LevelSender Pre-Start Diagnostics

When all the tests are passed, click **Start LevelSender** to complete the setup of your LevelSender station. You should receive a message that programming was successful, and that you may disconnect the USB cable. Click OK, and the LevelSender station will start collecting data at programmed start time.

Note: A LevelSender station can be stopped from sampling/reporting by going to the Diagnostic Information tab (Section 8.1), or remotely using the LevelSender Changes tab if the Enable Remote Configuration box was selected during the initial setup, see Section 4.2.3 (will still check for remote updates at report rate, see Section 4.3).

You can check to see that the test emails and text messages were received by the programmed recipients, including the Home Station email, by clicking



4.3 LevelSender Changes

A LevelSender can be updated with changes in two ways:

- Directly, by connecting it to a PC with the USB cable and using the LevelSender Software.
- Remotely, by using the LevelSender Changes tab in the LevelSender Software (if enabled – see Section 4.2.3).

4.3.1 LevelSender Updates via USB

If you need to make changes to the SIM card settings, LevelSender Email, or data recipients, you will need to do this by connecting to the PC with the USB cable and using the LevelSender Setup Wizard.

Select the LevelSender station from the list in the LevelSender Software, click  to start the Setup Wizard. See Section 4.2.

If you want to stop the LevelSender, use the **Diagnostic Info** tab (see Section 8.1).

You can use the **LevelSender Changes** tab to remotely update the sampling/reporting schedule for a LevelSender (see Section 4.3.2). You will need to use this tab if you want to set your connected dataloggers to record independently.

4.3.2 Remote LevelSender Updates

To make changes to a remote LevelSender station, click the LevelSender from the list in the LevelSender Software, then click on the **LevelSender Changes** tab.

The unique email that you set to be associated with the LevelSender will appear in the **LevelSender Email** field. (see Section 4.2.3).

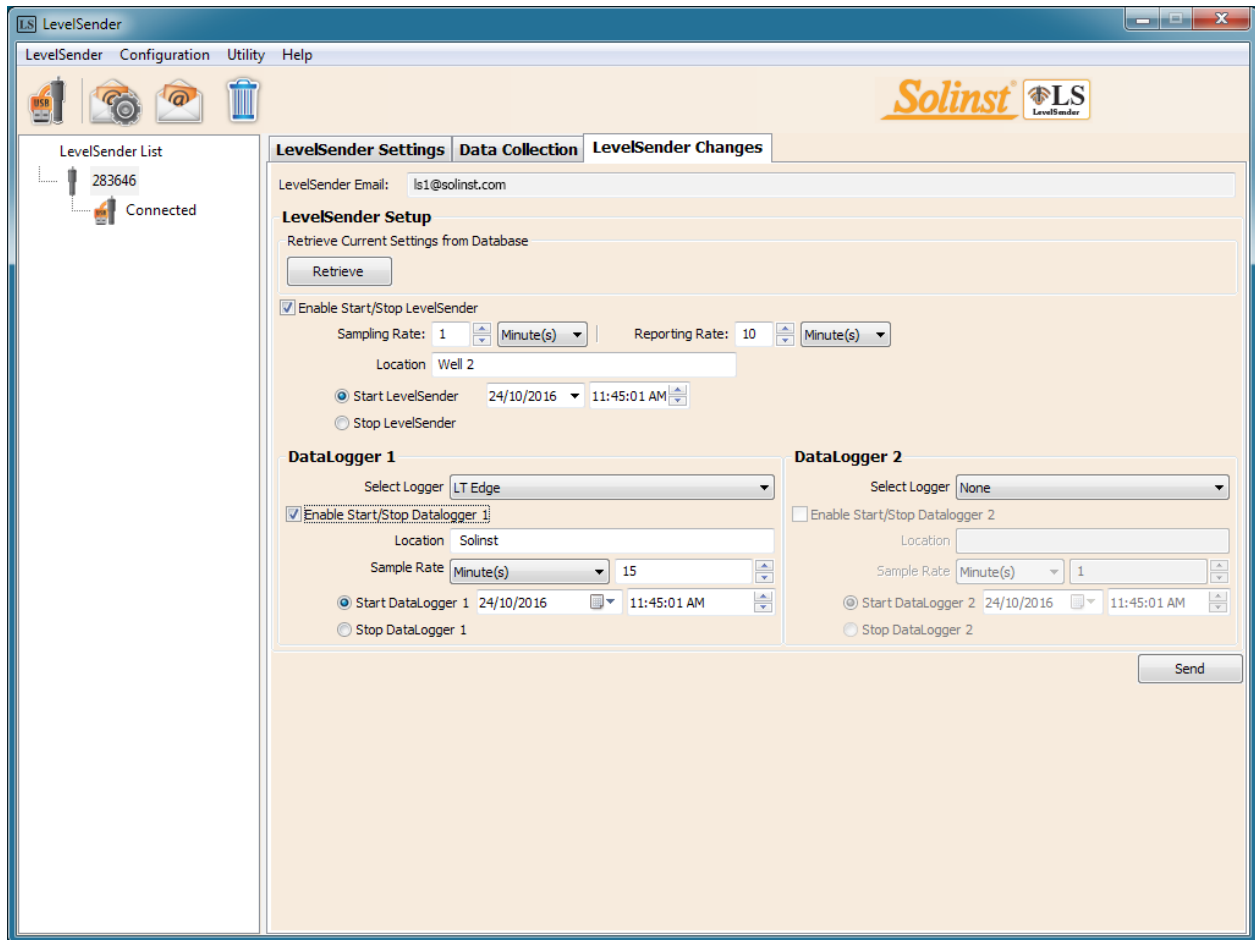


Figure 4-9 LevelSender Changes Tab

Click the **Retrieve** button to obtain the current LevelSender and datalogger settings. The datalogger settings are only available after the LevelSender Software has received at least one data email.

From here, you can edit the LevelSender Setup, including Sampling Rate, Reporting Rate, and Location.

You can set a new Start time for the LevelSender, or Stop a LevelSender from sampling/reporting.

Note: If you Stop a LevelSender, it will stop sampling/reporting, but will continue to check for remote email updates (e.g. a new start time) from the Home Station at the set reporting rate. It will use a small amount of battery and data during these checks.

Note: To stop your LevelSender from reporting **and** checking for updates, it must be done with the LevelSender directly connected to the LevelSender Software using the USB cable and the Diagnostics Info tab (See Section 8.1).

You can also set the connected dataloggers to record independently in their own internal memory. You can program the following for each connected datalogger:

- **Datalogger Type:** select the type of datalogger connected, e.g. Levellogger Edge, Barologger Edge, etc.
- **Location:** specific site / location information that you input to identify each datalogger.
- **Sampling Rate:** the rate at which the datalogger records in its internal memory. Sampling rate depends on the type of datalogger connected.

Note: When using a Splitter, the number 1 or 2 will identify the Dataloggers in LevelSender Software. The numbers are labeled directly on the Splitter.

You can also set a start time for the datalogger, or stop the datalogger if it is already recording independently.

Note: See the Levellogger User Guide for more information on each datalogger type, and their logging capabilities.

Once you have finished editing the LevelSender settings, click **Send**. You should get a message that the configuration email was successfully sent to the remote LevelSender station.

A copy of this remote LevelSender update configuration email can be viewed in the Sent Email tab in the Data Collection tab (see Section 5.3).

These changes will be applied to the remote LevelSender station at its next scheduled report interval (as set in Step 5 of the LevelSender Setup Wizard (see Section 4.2.5)).

Once the new settings have been applied, an email will be sent from the LevelSender to the Home Station.

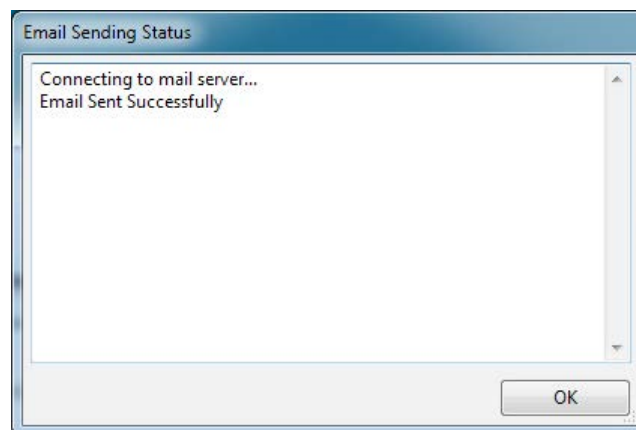


Figure 4-10 Successful Configuration Email Send

5.0 LevelSender Data

Data sent in each LevelSender report can be viewed/accessed in four different ways:

- As an email
- As an SMS (text) message
- Using the LevelSender Software
- In the SQLite database on the Home Station PC

Note: *.xle data files are also automatically saved on the Home Station PC in this default location: <C:\Users\Name\Documents\LevelSender\Data> (See Section 5.3.2).

5.1 Data From Email

Data is sent to each Email Recipient at the set Reporting Rate. Each report includes the LevelSender serial number, report number, location, battery life, sampling/reporting schedule, status and report time.

Information about each connected datalogger is also included, such as battery life, total logs in memory, and logging information if they have been set to record independently.

The data from each datalogger sample is then listed.

Summary messages are included at the end of the email.

```

283647 LS Report 1

LevelSender                               Logger 1 Samples
Serial: 283647                             Time, Temperature(Deg C), Level(m)
Location: Well 2                           19/08/2016 12:03:20, 23.6470, 0.4508
Battery: 89%                               19/08/2016 12:04:20, 23.6400, 0.4506
Sample Rate: 1 minutes                     19/08/2016 12:05:20, 23.6360, 0.4502
Report Rate: 5 minutes                     19/08/2016 12:06:20, 23.6310, 0.4504
State: reporting                           19/08/2016 12:07:20, 23.6200, 0.4506
Start Report: 19/08/2016 12:03:20

Logger 1                                    Logger 2 Samples
Location: aug8test1                        Time, Temperature( C), Level(m)
Type: Levellogger Gold                    19/08/2016 12:03:20, 23.5340, 10.0094
Serial: 1018258                             19/08/2016 12:04:20, 23.5390, 10.0095
Battery: 98%                               19/08/2016 12:05:20, 23.5380, 10.0093
Total Logs: 60 of 40000                    19/08/2016 12:06:20, 23.5350, 10.0097
Log Rate: 0 seconds                        19/08/2016 12:07:20, 23.5300, 10.0098
Memory Mode: slate
Log Type: linear
State: stopped
Start Logger: 09/08/2016 10:07:45

MESSAGE: Email+SMS report 1, LS reporting, L1 stopped, L2 stopped, commands received 1,

Logger 2
Location: aug8test1
Type: Levellogger Edge
Serial: 2010162
Battery: 96%
Total Logs: 1 of 25000
Log Rate: 60 seconds
Memory Mode: slate
Log Type: event
State: stopped
Start Logger: 09/08/2016 10:02:49

```

Figure 5-1 LevelSender Email Message

5.2 Data From SMS

Data is sent to one SMS Recipient at the set Reporting Rate. The same information that is sent to the email recipients, is seen in the SMS message (see Section 5.1).

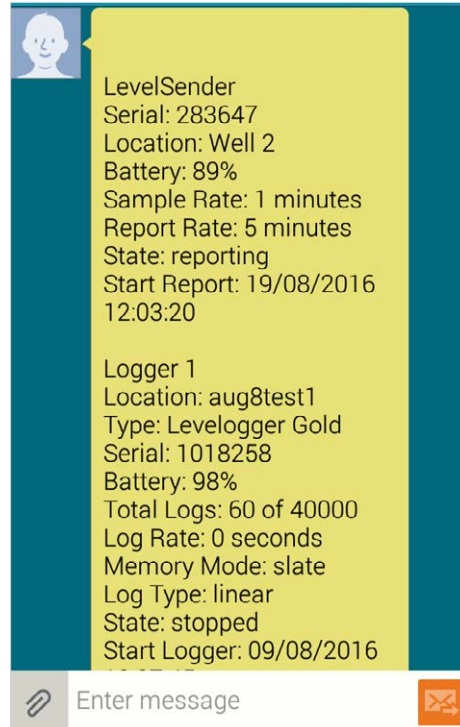


Figure 5-2 LevelSender SMS Message

5.3 Data From LevelSender Software

To access emails and data files, select the station from the LevelSender List in the LevelSender Software, then click on the **Data Collection** tab.

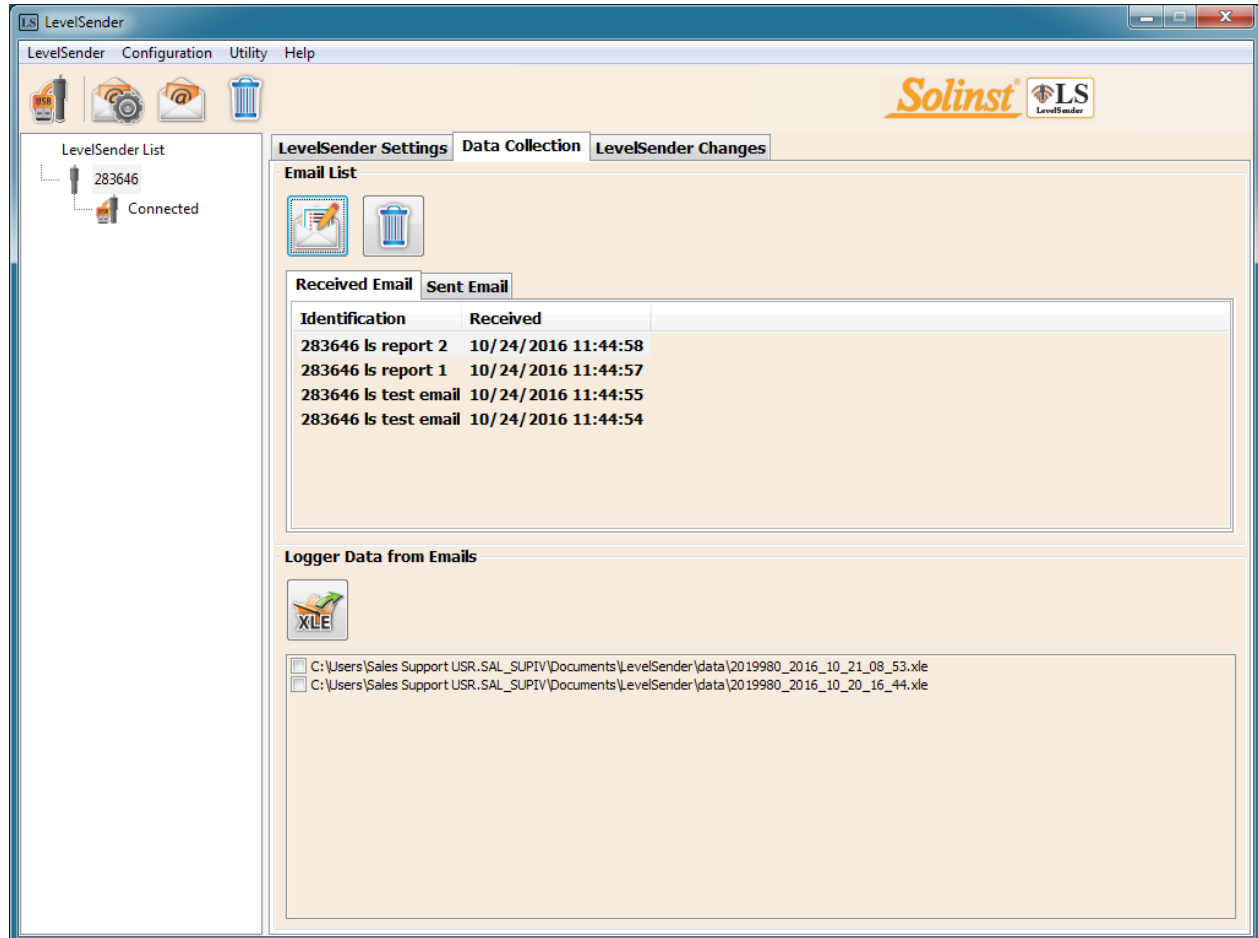


Figure 5-3 LevelSender Data Collection Tab

5.3.1 Viewing Emails


The **Email List** window will display all of the Received Emails (Reports) from the selected LevelSender Station. Each Received Email is identified by the LevelSender serial number, report number, and the date that it was received.

Sent emails (remote LevelSender update configuration emails) will be displayed in the Sent Emails tab. Each Sent Email is identified by the LevelSender serial number, and the date that the update email was sent.

Note: If you open data report messages sent to the Home Station email using the email program and not LevelSender Software, those reports will not be listed in the Received Email window. Only “unread” messages will be listed.

Note: Click  to check the Home Station email in the Level Sender Software.

Click  , or double-click the email in the list, to open the email in a text editor program.

Click  to delete the selected email.

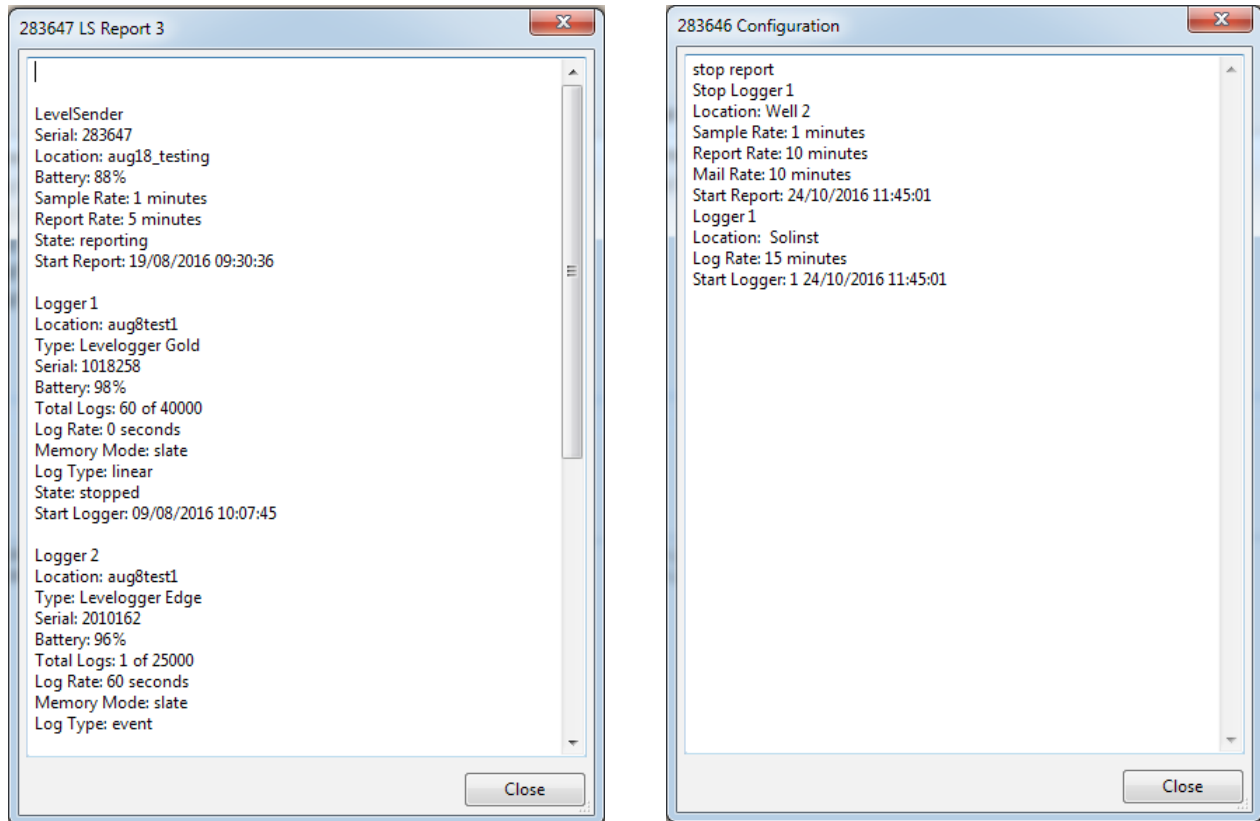


Figure 5-4 LevelSender Data Text File and Configuration Email Text File

5.3.2 Viewing and Exporting Data Files

Based on the Levellogger data from each Received Email, *.xle files are created and listed in **Logger Data from Emails** window.

The files are also automatically saved on the Home Station PC in this default location:
<C:\Users\Name\Documents\LevelSender\Data>

You can change the default location by going to the **Configuration** menu and selecting Output File Path.

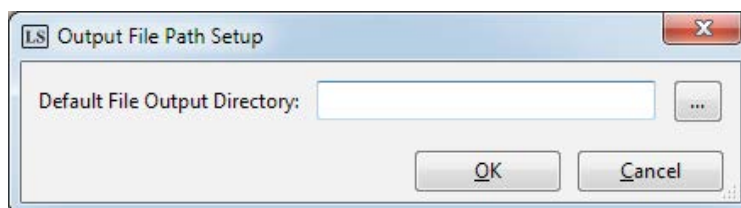


Figure 5-5 Configure Output File Path

Select an *.xle file and click  to export and save the *.xle file to a different location.

These data files can be opened using Solinst Levellogger Software. See the Levellogger User Guide for more information.

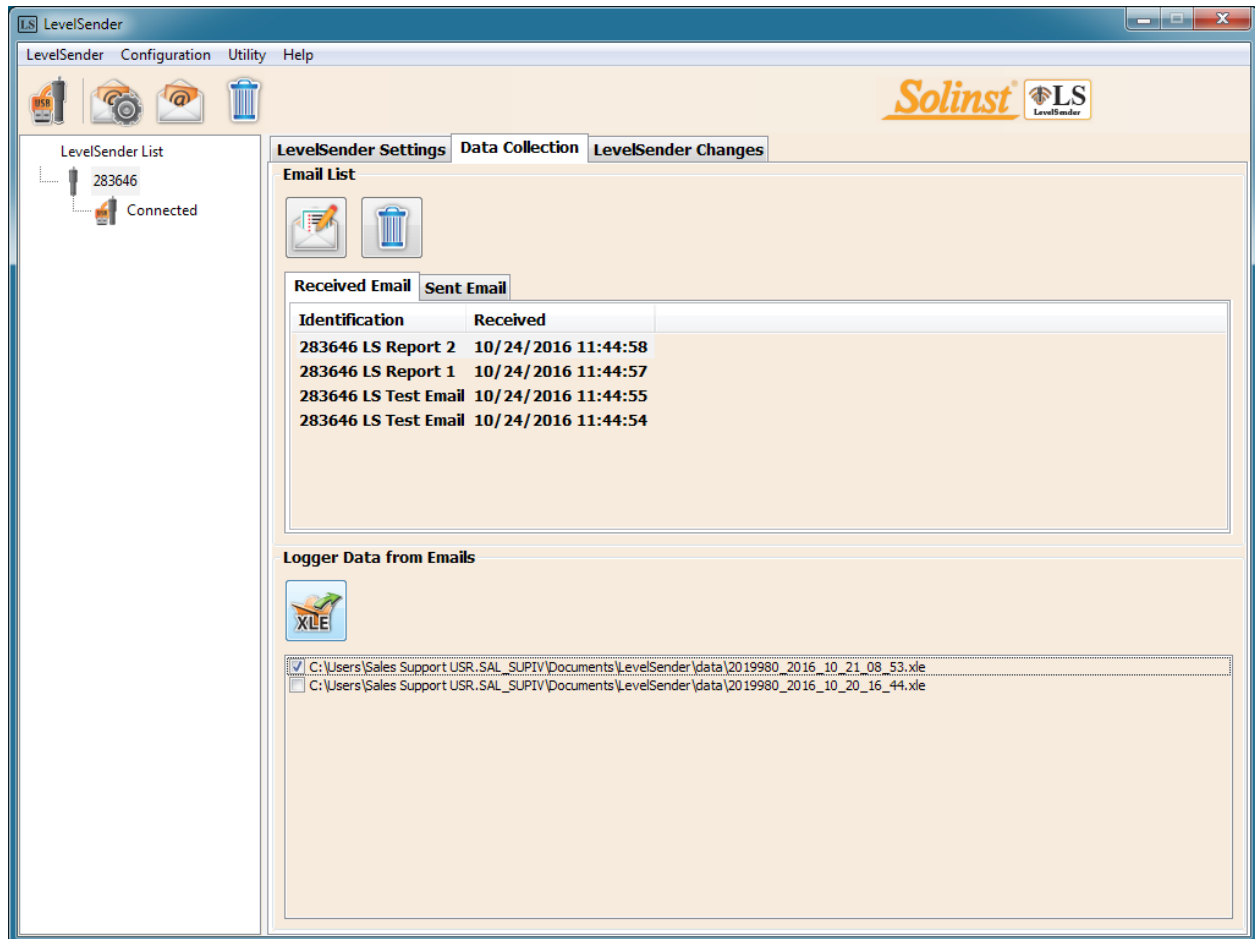


Figure 5-6 Exporting *.xle Files

5.4 Home Station Database

Data received in each report from a LevelSender station is placed in a SQLite database (*.sqlite file) on the Home Station computer. New data is appended to the existing database. The program will save data to a folder that will automatically be created in your Documents folder on your PC. Typical default directory: <C:\Users\Name\Documents\LevelSender\db>

The SQLite database can be queried by your own macros or applications to automatically check for updates and display the data in your own program, on a website, or in any way you choose.

6.0 LevelSender Installation

The LevelSender is designed to be conveniently installed in a 2" well casing (4" with an adaptor). However, other installations are acceptable, if proper precautions are followed.

The LevelSender has an IP rating of 64 (dust and splash proof), so should not be submerged. The operating temperature range is -20 to 60°C.

You should have already installed the SIM card and batteries before configuring the LevelSender using the PC Software, as well as the antenna (see Section 2).

Note: You may want to consider the use of an extended top cap style protective well head. This would allow full access to the LevelSender components at the top of the monitoring well. If made of a plastic, it would eliminate signal interference that protective metal casing can cause.

6.1 Installing a LevelSender in a Well

Each LevelSender station comes with a 2" Well Cap Assembly and a Support Hanger Bracket. To accommodate 4" wells, an optional adaptor is available for use with the 2" well cap base.

The Support Hanger Bracket is recommended to add extra security to the Reader Cable(s) when deployed.



Figure 6-1 LevelSender Installation Accessories

The following is the recommended method for installing a LevelSender in a 2" well:

1. If you are connecting a LevelSender to a Levellogger already installed in the field with a Direct Read Cable and Solinst Well Cap Assembly, you will need to remove the installation from the well. You may save the well cap base, but you do not need the well cap insert.

Note: Each LevelSender comes with a 2" Well Cap Assembly, without the insert.



Remove Existing Levellogger Installation



Remove the Well Cap Insert from the Well Cap Base

Figure 6-2 Remove Existing Installation

Note: If you are installing a Levellogger and a Barologger in the same well, you will need a splitter to connect both dataloggers to the LevelSender. See Section 2.4.1.

2. Install the well cap base on the well casing.



Figure 6-3 Install the Well Cap Base

3. Wrap the Reader Cable around the Support Hanger Bracket, similar to what is shown in the photo below, leaving about 6" of slack above the top of the bracket. Use zip ties to secure the cable to the bracket.

Note: Providing enough slack above the bracket allows you to lift the LevelSender from the well cap base to make room for a Water Level Meter for periodic depth to water measurements, without disturbing the datalogger(s) from their downhole position.

If installing a Barologger, secure the second Reader Cable to the Support Hanger Bracket using the same method.

The length of Reader Cable wrapped around the Support Hanger Bracket will depend on your application. If you are installing a Barologger in the same well, the Reader Cable/Direct Read Cable connection will need to be staggered from the Leveloggers connection in order to fit in a 2" well casing. Staggering the connections also allows more space for a Water Level Meter for periodic manual depth to water measurements. See Section 6.2.

Note: Ensure the weight of the reader cable is not resting on a zip tie, but instead supported by one of the cutouts in the bracket.



Figure 6-4 Secure the Reader Cable to the Support Hanger Bracket

4. Connect the Levellogger to the Direct Read Cable (see Levellogger User Guide for more information, if required). Connect the Direct Read Cable to the Reader Cable. See Section 2.4 for more details. Slowly lower the datalogger(s) down the well.



Figure 6-5 Connect the Direct Read Cable and Levellogger

5. Lower the assembly until the Support Hanger Bracket seats on the shoulder in the well cap base.

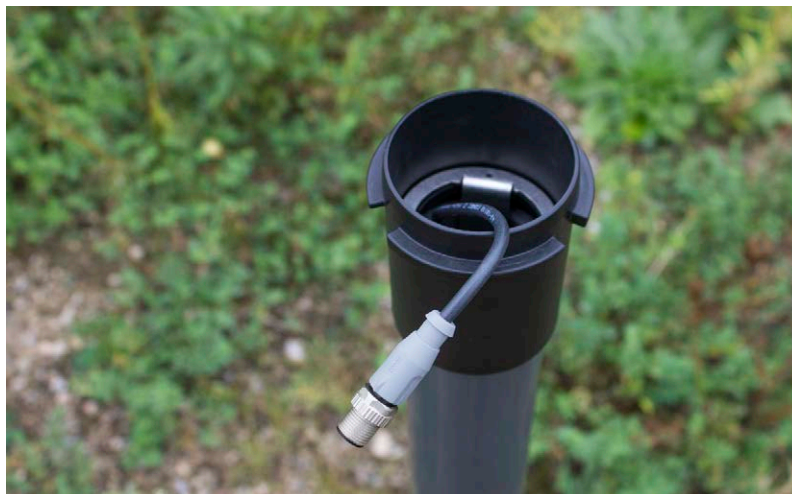


Figure 6-6 Lower the Assembly into the Well

Note: There are three holes in the top of the Support Hanger Bracket that can be used to secure it in the well cap base with screws.

6. Connect the top end of the Reader Cable to the LevelSender (or Splitter). See Section 2.4 for more details.



Figure 6-7 Connect the Reader Cable to the LevelSender

Note: Providing enough slack at the top of the well allows you to lift the LevelSender from the well cap base, in order to make room for a Water Level Meter for periodic depth to water measurements, without disturbing the datalogger(s) from the downhole position.

7. Carefully push the excess Reader Cable(s) into the well, while lowering the LevelSender into position. The LevelSender has flat sides so it fits alongside the Support Hanger Bracket. The LevelSender will seat on the shoulder in the well cap base.



Figure 6-8 Lower the LevelSender into Position

8. With the antenna in a bent position, you can install the well cap onto the well cap base.



Figure 6-9 Install the Well Cap

Note: See the Levellogger User Guide for more specific details on installing Levelloggers and Barologgers.

6.2 LevelSender Installation Examples

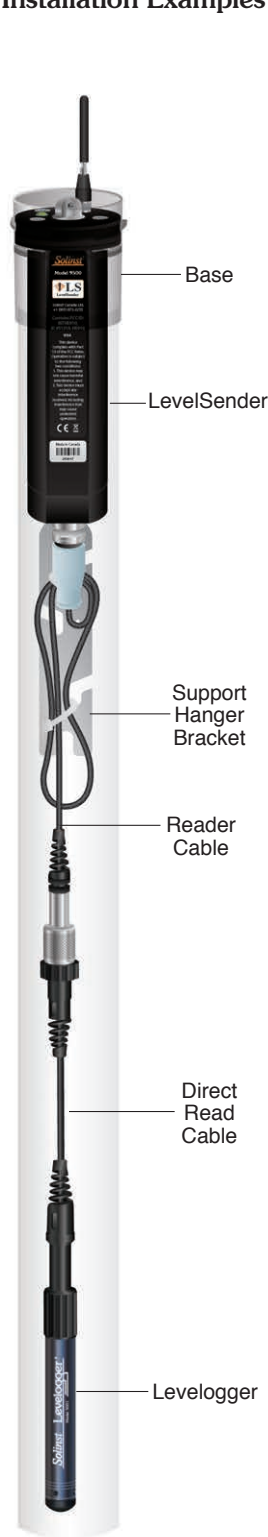


Figure 6-10 Single Levellogger Installation



Figure 6-11 Levellogger and Barologger Installation (Reader Cable Connections Staggered)

7.0 LevelSender Maintenance

As with any groundwater or surface water monitoring project, you should select the proper equipment and determine a maintenance schedule based on the monitoring environment specific to your application.

For the LevelSender and Levelloggers, this means selecting the appropriate pressure range, ensuring the monitoring temperatures are within the instruments specifications, and making sure the wetted materials are compatible with site chemistry. See the Levellogger User Guide for important information about maintaining your Levellogger dataloggers.

Replacing the LevelSender batteries will have to be done on a regular basis, and is based on usage. See Section 2.3 for battery life estimates and installation instructions. Battery life percentage is sent with each LevelSender report to allow remote battery level monitoring.

When not in use, the Reader Cable should be disconnected and the dust cap replaced on the LevelSender datalogger connection. Batteries and SIM cards should be removed from the LevelSender during storage.



7.1 Firmware Updates

The Firmware Upgrade Utility is used to upload new firmware files to a LevelSender. The Firmware Upgrade Utility can be launched from the **Utilities** menu at the top of the LevelSender Software.

The zipped firmware file can be obtained from: <http://www.solinst.com/downloads/>

Make sure to unzip the firmware file after you have downloaded it, so you can access the *.ssf file.

To upload new firmware to an LevelSender, follow these steps:

1. Connect the LevelSender station to the PC using the USB cable (ensure the Reader Cable/Splitter is disconnected and the LevelSender has been stopped – see Section 8.1).
2. Open the Solinst Firmware Upgrade Utility from the Utilities menu in the main LevelSender Software window. Pick the Com Port to which the LevelSender is connected and make sure the Baud Rate is set to 9600.
3. Click the 'Open' button  , which should open a file dialog asking for the firmware file (*.ssf) to upload. Navigate to the directory where the firmware file was saved on your PC, then click on the file and click 'Open'.
4. Check the 'Firmware File Information' box to make sure the opened file is correct.
5. Click the 'Upload Firmware' button  , to start the firmware upload process.
6. If a communication error occurs and is indicated in the LevelSender Information Window either before the 'Verified Program Checksum' message or after the 'Program Information Section', then restart the upgrade process.
7. If, however, a communication error occurs between the 'Verified Program Checksum' and the 'Program Information Section' messages, then please contact Solinst. You will need to give the LevelSender serial number and explain the exact positioning of the error message.

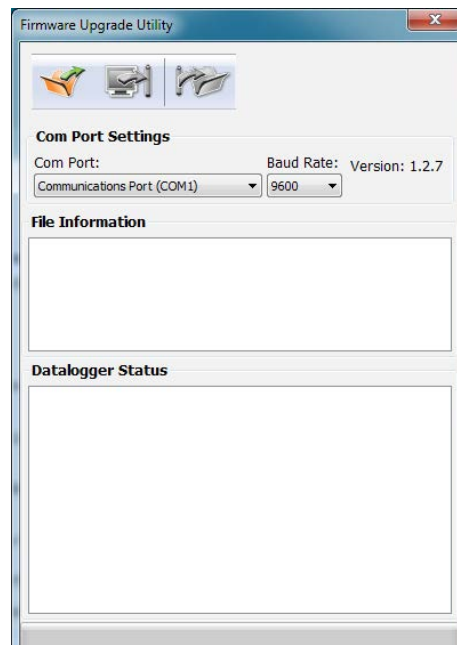


Figure 7-1 LevelSender Firmware Upgrade

Note: It is important that the communication between the PC and the LevelSender is not interrupted during a firmware upload, so please make sure to close any other running programs, including screen savers, and do not disconnect the LevelSender before the upload is finished.

8.0 LevelSender Troubleshooting

Battery life percentage is sent with each LevelSender report to allow for remote monitoring.

8.1 LevelSender Diagnostic Information

The **Diagnostic Information** tab can be used to perform individual diagnostic tests when the LevelSender is connected to the PC with the USB cable.

Test LevelSender Battery: this test will fail if the LevelSender battery is below 2.5 volts.

Test Mobile Connection: checks if the LevelSender is connected to the mobile carrier. The possible causes of failure are: improperly inserted SIM Card, low signal strength or power failure.

Send Test Email: Sends a test email through the LevelSender email.

Test Datalogger: tests the communication on the attached datalogger(s).

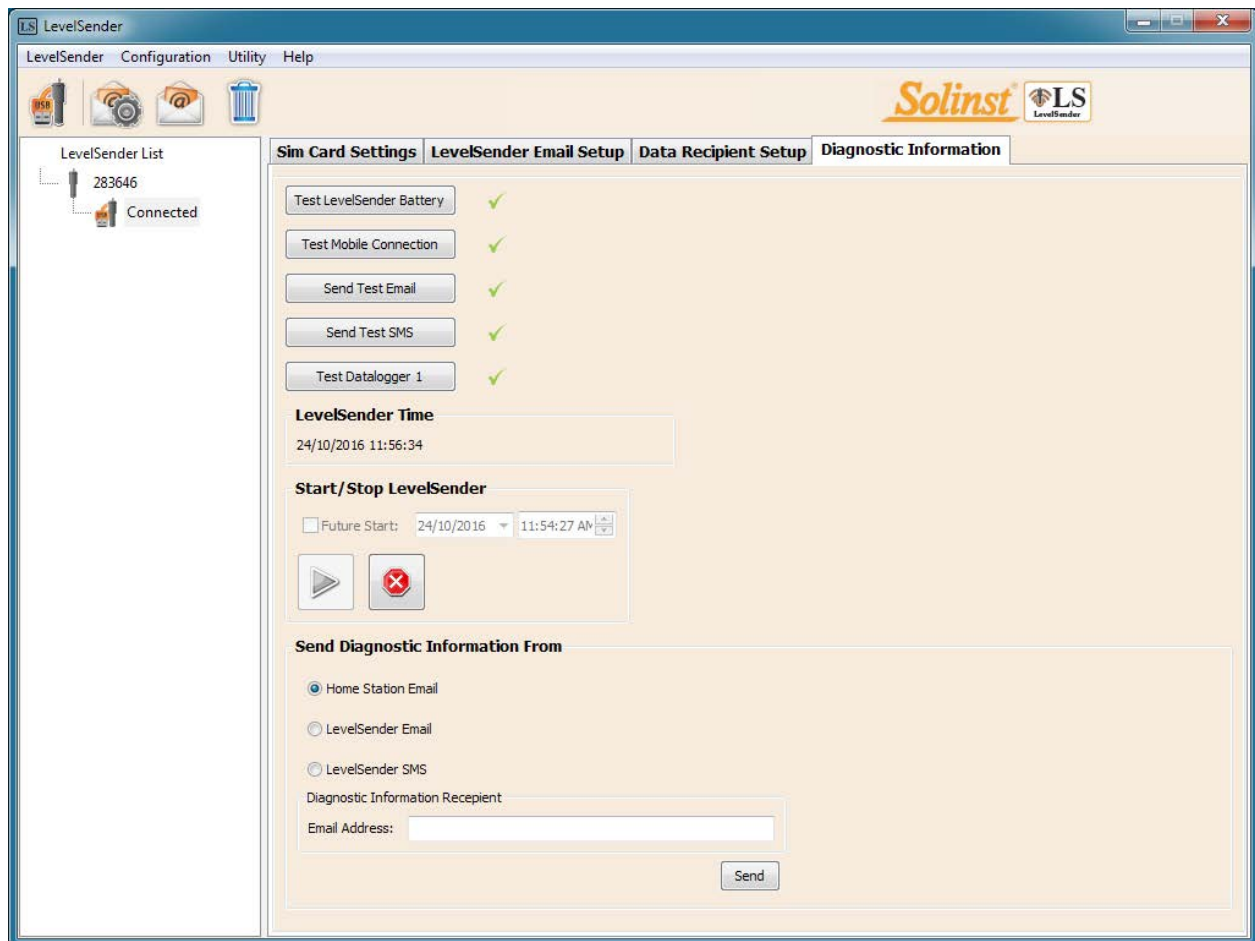


Figure 8-1 LevelSender Diagnostic Information

From this tab you can also stop  or start  a LevelSender immediately, or set a future start time by checking the box, setting the time, and clicking the start button.

After performing all of the tests, you can send a diagnostic report from the Home Station email, LevelSender Email, or LevelSender SMS to an email recipient of your choice.

The report can be used for your own purposes, or sent to Solinst for further assistance.

```
283646 Configuration

LS SETTINGS
Serial Number: 283646
Software Version: 1.0000
Software Build: 811.000
Hardware Version: 1.0000
Battery Voltage: 4.9482
State: stop
Report Port: email
Started: 24/10/2016 11:45:58
Stopped: 24/10/2016 11:36:42
Reports Sent: 0
Samples Taken: 0
Emails Sent: 1
Emails Received: 0
SMS Sent: 1
SMS Received: 0
Mail Rate (min): 10
Reply Anyone: on
User Password: off
Admin Password: off
Detail: off
Startup: report
AutoTime: 1
Radio Timing1: TimeOut(ms)=150 Retries=3 Delay(ms)=50 PowerUp(ms)=16000
Radio Timing2: DataTime(ms)=500 UseRxTimers=1 DropTime(ms)=111
Mail Timing: SMSDelay(ms)=3000 MaxMail=20 MailDelay(ms)=0 MailLines=100
Logger Timing: RxTimeOut(ms)=500 Retries=3 Delay(ms)=10 TxTimeOut(ms)=2
Prompt: 0
SMS Report: on
Clear Inbox: 3
DCO: 243
Time Compensation: 0

LevelSender
Serial: 283646
Location: Well 2
Battery: 86%
Sample Rate: 1 minutes
Report Rate: 10 minutes
State: stopped
Start Report: 24/10/2016 11:45:58

Logger 1
Location: remote change test
Type: Levellogger Edge, M5, 3.0040
Serial: 2019980
Battery: 66%
Total Logs: 661 of 40000
Log Rate: 10 seconds
Memory Mode: slate
Log Type: linear
State: stopped
Start Logger: 12/10/2016 12:13:07
```


Figure 8-2 LevelSender Diagnostic Report Example

9.0 Appendix

9.1 Gmail Setup Information

9.1.1 IMAP Setup

Enable IMAP in your Gmail settings:

1. Sign in to Gmail.
2. Click the gear in the top right .
3. Select Settings.
4. Click Forwarding and POP/IMAP.
5. Select Enable IMAP.
6. Click Save Changes.

Incoming Mail (IMAP) Server - Requires SSL

- imap.gmail.com
- Port: 993
- Requires SSL: Yes

Outgoing Mail (SMTP) Server - Requires TLS

- smtp.gmail.com
- Port: 465 or 587
- Requires SSL: Yes
- Requires authentication: Yes
- Use same settings as incoming mail server

Full Name or Display Name: [your name]

Account Name or User Name: your full Gmail address (username@gmail.com). Google Apps users, please enter username@your_domain.com

Email address: your full Gmail address (username@gmail.com) Google Apps users, please enter username@your_domain.com


Password: your Gmail password

If your client does not support SMTP authentication, you will not be able to send mail through your client using your Gmail address.

Also, if you are having trouble sending mail but have confirmed that encryption is active for SMTP in your mail client, try to configure your SMTP server on a different port: 465 or 587.

9.1.2 POP Setup

Here is how to enable POP in Gmail:

1. Sign in to Gmail.
2. Click the gear in the top right .
3. Select Settings.
4. Click Forwarding and POP/IMAP.
5. Select Enable POP for all mail or Enable POP for mail that arrives from now on.
6. Choose what to do with your messages after your POP client or device receives them.
7. Click Save Changes.

Although the radio button next to your selected option may not stay selected, Gmail displays the status next to 'POP Status:.' When you enable POP, your settings display 'POP Status: POP is enabled.'

If your POP settings are turned off, the status will indicate that POP is disabled.

Standard configuration instructions:

Incoming Mail (POP3) Server - requires SSL:	pop.gmail.com Use SSL: Yes Port: 995
Outgoing Mail (SMTP) Server - requires TLS or SSL:	smtp.gmail.com Use Authentication: Yes Port for TLS/STARTTLS: 587 Port for SSL: 465
Server timeouts	Greater than 1 minute, we recommend 5
Full Name or Display Name:	[your name]
Account Name or User Name:	your full email address (including @gmail.com or @your_domain.com)
Email Address:	your email address (username@gmail.com or username@your_domain.com)
Password:	your Gmail password

Unless you are using recent mode to download mail to multiple clients, make sure you have opted not to leave messages on the server. Your POP settings in Gmail settings are what determines whether or not messages stay on the server, so this setting in your client will not affect how Gmail handles your mail.

If your client does not support SMTP authentication, you will not be able to send mail through your client using your Gmail address.

If you are having trouble sending mail but have confirmed that encryption is active for SMTP in your mail client, try to configure your SMTP server on a different port (465 or 587).

9.2 Yahoo Mail Setup Information

9.2.1 IMAP Setup

Here are the settings you will need to configure your mail client or app.

Incoming Mail (IMAP) Server

- Server - imap.mail.yahoo.com
- Port - 993
- Requires SSL - Yes

Outgoing Mail (SMTP) Server

- Server - smtp.mail.yahoo.com
- Port - 465 or 587
- Requires SSL - Yes
- Requires authentication - Yes

Your login info

Email address - Your full email address (name@domain.com)

Password - Your account's password

Requires authentication - Yes

9.2.2 POP Setup

Here are the settings you will need to configure your mail client or app.

Incoming Mail (POP) Server

- Server - pop.mail.yahoo.com
- Port - 995
- Requires SSL - Yes

Outgoing Mail (SMTP) Server

- Server - smtp.mail.yahoo.com
- Port - 465 or 587
- Requires SSL - Yes
- Requires TLS - Yes (if available)
- Requires authentication - Yes

Your login info

- Email address - Your full email address (name@domain.com.)
- Password - Your account's password.
- Requires authentication - Yes



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