Electronic Design Service (EDS)

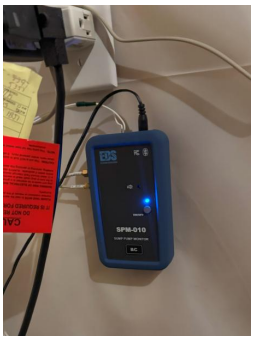
Engineering Solutions for Avionics and Electrical Systems

SPM-010 / SPM-010BC

Smart Samp Pump Monitoring & Control Unit

Bluetooth & Cellular Sump Pump Monitoring / Control Solution

Water Level Monitoring | Power Loss Detection | Remote Notifications |Pump Control



Key Features

- Monitoring
- Alerts
- Bluetooth
- Cellular LTE (SPM-010BC)
- Battery Backup
- Pump Control

User Guide
Model: SPM-010 / SPM-010BC
Version 1.0
2026

Electronic Design Service
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SPM-010 / SPM-010BC Sump Pump Monitoring & Control Unit

User Guide

About This Guide

This user guide provides detailed instructions for setting up and using the **SPM-010** and **SPM-010BC** sump pump monitoring and control devices. These devices are designed to help homeowners monitor critical sump pump parameters and prevent flooding due to equipment failure.

Overview

The **SPM-010** and **SPM-010BC** are smart sump pump monitoring and control units that use **Bluetooth** and **cellular technology (SPM-010BC)** to deliver real-time updates and alerts. Both devices monitor key environmental factors, such as water level, power supply status, and air temperature, and notify users of potential flooding risks.

SPM-010

The SPM-010 is a budget-friendly monitoring and control device that communicates with smartphones or tablets via **Bluetooth**.

- **Monitoring Function:** Requires a stationary smartphone or tablet at home for continuous monitoring.
- **Control Function:** Optional. Requires the **SSR-CU** power control module (sold separately).
- **Power Backup:** Includes a built-in rechargeable battery for continued operation during power outages.
- **Notifications:** Sends alarm messages through a paired smartphone or tablet.

Key Features:

- Monitors power loss, sump water level (with adjustable alarm thresholds), and air temperature

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- Displays device status and battery charge
- Sends SMS alarms via a connected home device

SPM-010BC

The SPM-010BC provides **independent** monitoring and control via **cellular (LTE)** connectivity.

- **Monitoring and Control:** Works continuously, without requiring a home smartphone or tablet.
- **Control Function:** Optional. Requires the **SSR-CU** module.
- **Power Backup:** Rechargeable battery allows the device to function during power loss.
- **Notifications:** Sends SMS messages directly to your phone, including alarm alerts and on-demand status reports.

Key Features:

- LTE connectivity ensures full independence from home Wi-Fi or local devices
- Monitors power loss, water level, and temperature
- Displays real-time system status via SMS or Bluetooth
- Accepts remote SMS commands for status checks

Figure 1 shows an example of the monitoring screen on an iPhone.

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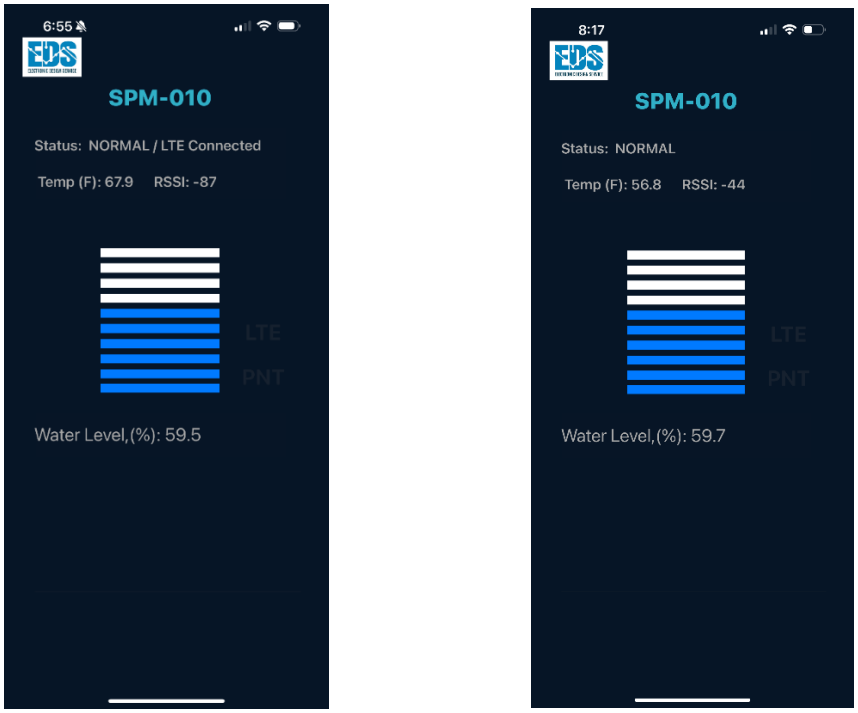

Figure 1 iPhone Screen examples

Device Advantages

SPM-010

- Operates without relying on Wi-Fi or internet
- Real-time data on water level, power, and temperature
- Optional pump control using the **SSR-CU** module
- Continues monitoring during power outages

Note: Requires a stationary smartphone or tablet at home for full functionality

See implementation example on Figure 2.

SPM-010BC

- Fully independent operation (no smartphone, tablet, or internet required)
- Sends and receives SMS alerts for status updates and alarms

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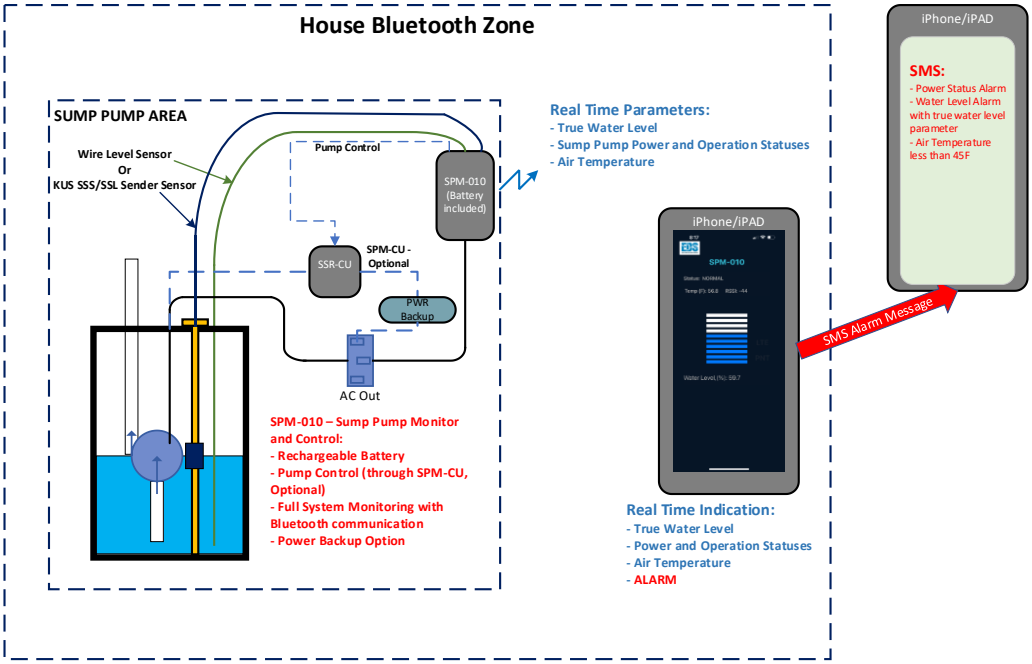
- Optional pump control using the **SSR-CU** module
- Remains operational during power loss

See implementation example on Figure 3.



SPM-010 Sump Pump Monitoring and Control with home stand Smartphone/Tablet

Figure 2 SPM-010 Monitoring and Control Implementation

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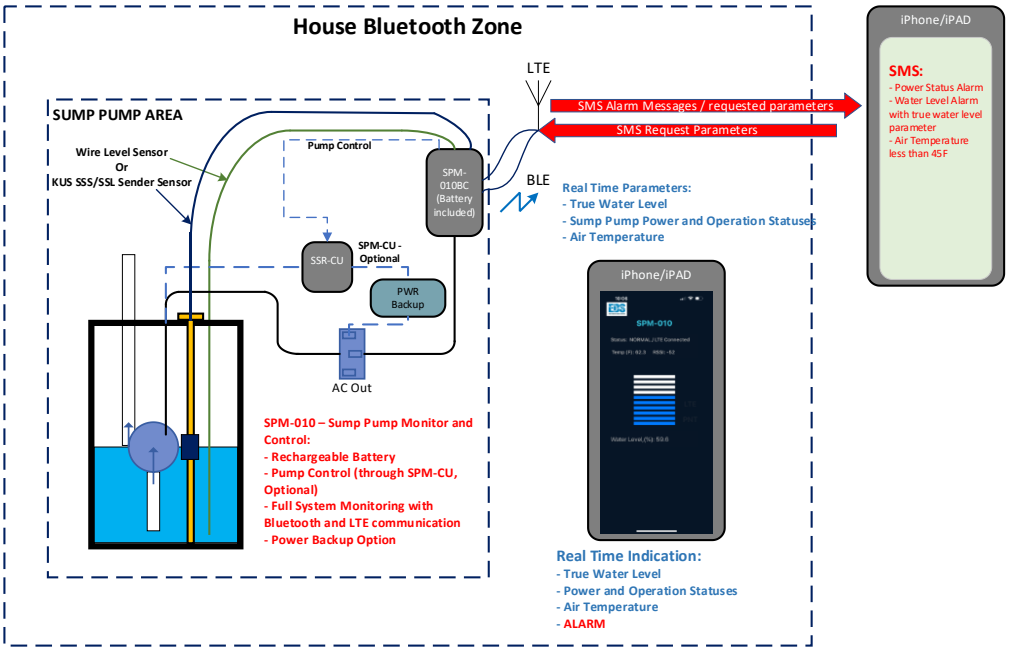

SPM-010BC Sump Pump Monitoring and Control

Figure 3 SPM-010BC Independent Monitoring and Control Implementation

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Technical Specifications

Feature	Details
Operating Temperature	32°F to 110°F (0°C to 45°C)
Operating Humidity	0–95%, non-condensing
Temperature Accuracy	±1.8°F (±1°C)
WS-010 Wire Sensor Length	72.8” (1.85 m)
WS-010 Sensor Range	0–37.4” (0.95 m)
WS-010 Accuracy	±2%
Calibration Range (WS-010)	Adjustable between 11.8” and 37.4” (0.3–0.95 m)
WS-010 Sensor Input	Two dry contact terminals
Resistive Sensor Type	240–33 Ohms (240 = empty, 33 = full)
Sensor Transfer Characteristics	KUS SSS-24 sensor (dual-linear branches, breakpoint at 21.3% length)
Resistive Sensor Resolution	0.827” (0.021 m)
Input Power	5V DC, 500 mA
Battery	3.7V Lithium-ion, 750 mAh (KLARUS LIR 14500 protected)
Bluetooth	BLE 4.2, 2.4 GHz integrated antenna
FCC Compliance	FCC CFR47, Part 15 and ARIB STD-T-66
Pump Control Interface	Two-pin LED control (max 3 mA) via **SSR-CU module**
SPM-010 App Compatibility	iOS 14.5 and above
SPM-010BC Cellular Network	AT&T (or other providers) LTE-M
SPM-010BC Antenna	External MIMO, dual-port LTE band antenna
SPM-010BC Cell Modem Compliance	FCC: MCQ-XB3M1 IC (Canada): 1846A-XB3M1

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What's in the Box

Configuration 1: SPM-010 Kit

- SPM-010 unit (see Figure 6)
- **WS-010** wire water level sensor *or* **KUS SSS/SSL** resistive sensor

  Note: KUS sensor is required for pump control

- AA-size dummy battery (to be installed in empty battery slot)
- 120V AC to 5V DC power adapter (see Figure 6)
- **SSR-CU power module** (optional, required for pump control — see Figure 7)

Configuration 2: SPM-010BC Kit

- SPM-010BC unit (see Figure 5)
- **WS-010** or **KUS SSS/SSL** resistive sensor (see Figure 4 – KUS sensor)

  Note: KUS sensor is required for pump control

- AA-size dummy battery
- 120V AC to 5V DC power adapter
- **SSR-CU power module** (optional – see Figure 7)
- External LTE band antenna (see Figure 8)

Figure 4 KUS SSS/SSL Resistive Sensor

Figure 5 SPM-010BC

Figure 6 SPM-010 with WS-010 and Power Adapter

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Figure 7 SSR-CU Pump Control Power Unit

Figure 8 LTE Band Antenna

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Installation and Adjustment

Before beginning installation, ensure the power is disconnected from all sump pump circuit breakers. If you're not familiar with electrical work, contact a licensed electrician or plumber.

Connections and Connector Panel

The Figure 9 provides guidelines for SPM-010 and SPM-010BC connections.

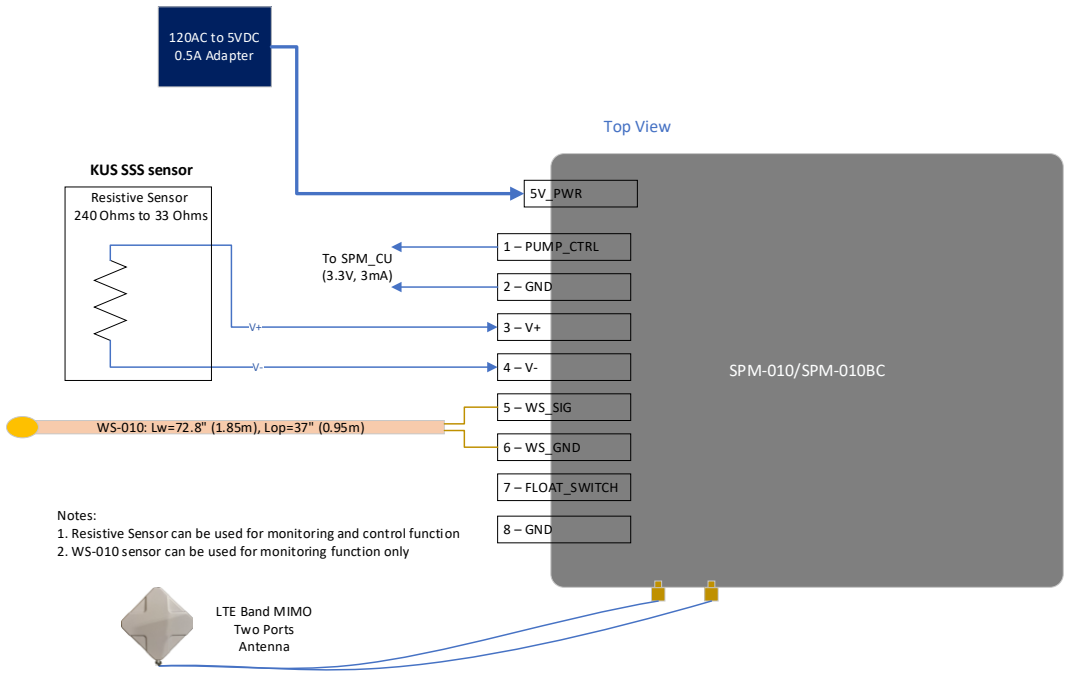

Figure 9 SPM-010 and SPM-010BC Connection Diagram

Sensor Installation Overview

There are two main sensor types supported:

- **WS-010 Wire Sensor** – Mounts vertically inside the sump or along the discharge pipe
- **KUS SSS/SSL Resistive Sensor** – Float-type resistive sensor mounted through the sump cover

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WS-010 Sensor Installation (Without SIP – Sensor Installation Pipe)

The WS-010 can be mounted directly onto the sump pump's **PVC discharge pipe**.

Steps:

1. **Position the Sensor**
   - Place the sealed sensor tip as close to the bottom of the sump pit as possible.
   - Use cable zip ties to secure the wire loosely along the pipe (don't overtighten).
2. **Avoid Interference**
   - Do not allow the sensor wire to touch sump power cables or metal piping.
   - Avoid locations that may interfere with the sump pump float.
3. **Seal the Entry Point**
   - If entering through a sump cover, seal the opening with waterproof silicone.

⚠️ **Important:** Do not cut or extend the sensor wire — this will affect accuracy.

📷 **See Figure 10:** WS-010 Sensor (without SIP) and SPM-010 installation

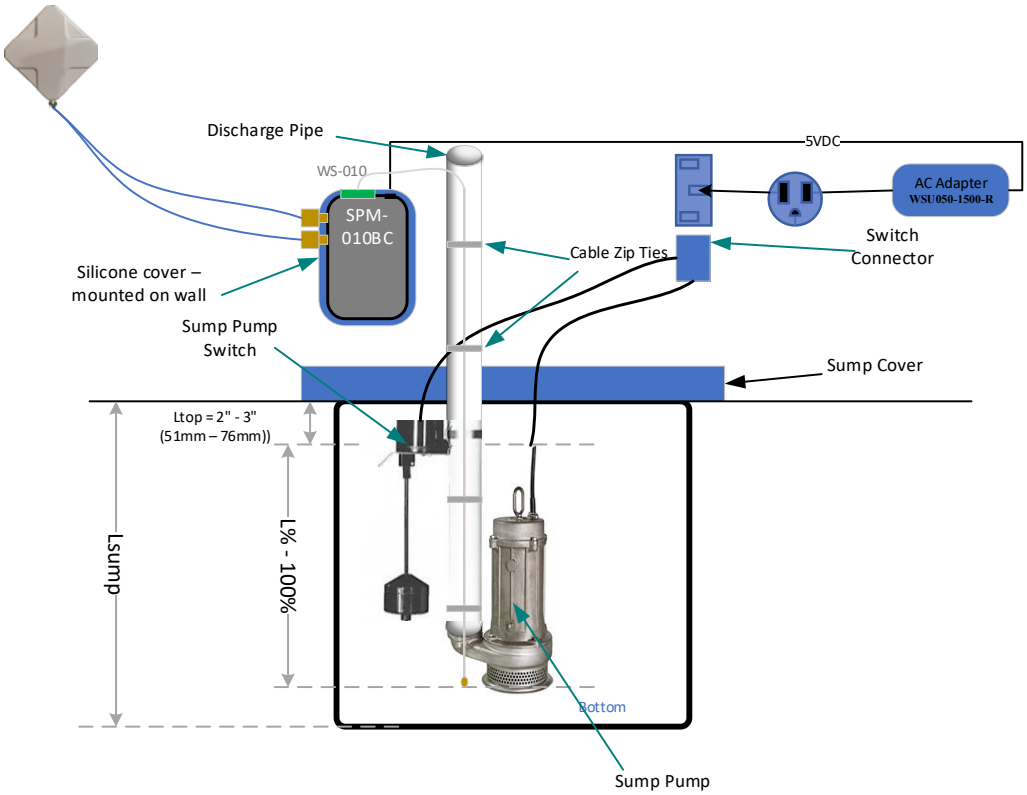

Figure 10 WS-010 Sensor (without SP) and SPM-010/SPM-010BC Installation

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WS-010 Sensor Installation (With SIP – Sensor Installation Pipe)

This method uses a ¼" plastic pipe (PEX or PVC) to house the sensor wire vertically.

Steps:

1. **Drill a Hole in the Sump Cover**
   - Size the hole to match the **outer diameter** of the SIP.
   - Ensure it's placed far from the pump and float switch, ideally at the deepest point.
2. **Measure and Cut the Pipe**
   - Determine total depth from cover to sump bottom: L_sump
   - Cut SIP length to: L_sump + H_cover + 2"
     (Where H_cover = sump cover thickness)
3. **Install the SIP and Sensor**
   - Insert SIP into the cover hole and seal with waterproof silicone.
   - Slide the WS-010 sensor into the SIP until it gently contacts the sump bottom.

📷 **See Figure 11**: WS-010 with SIP and SPM-010 installation diagram

⚠️ **Reminder:** Do not modify the length of the sensor wire.

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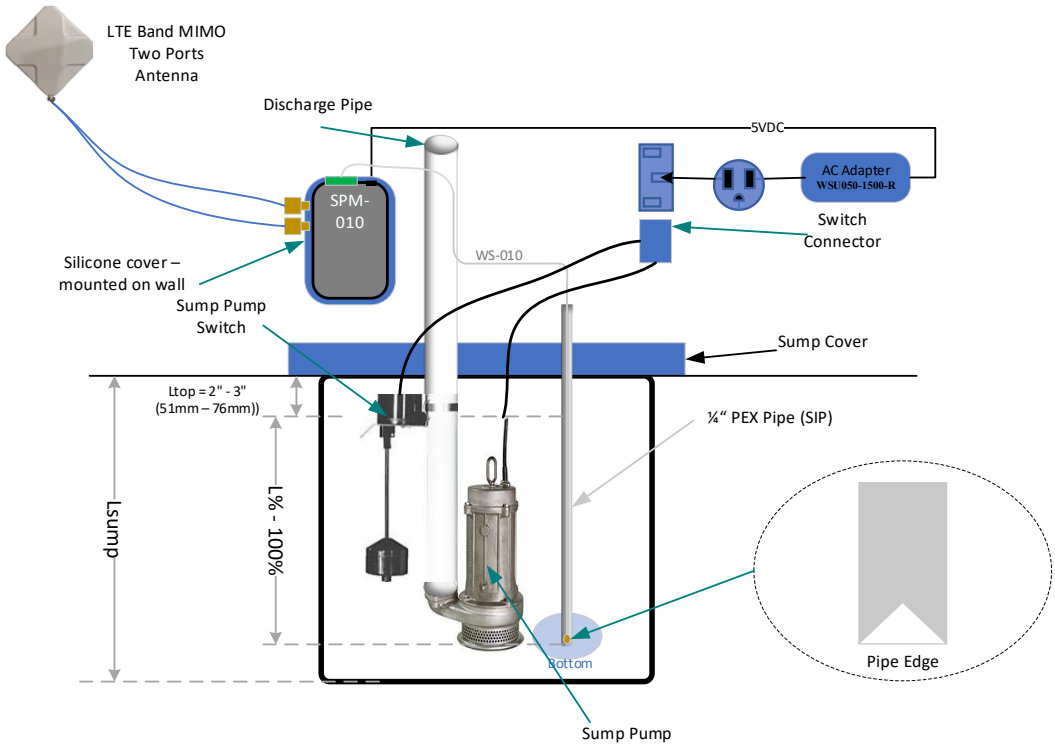

Figure 11 WS-010 Sensor with SIP and SPM-010 Installation

KUS SSS/SSL Resistive Sensor Installation

This sensor is a float-based resistive type and installs directly through the sump cover.

Steps:

1. **Measure and Order Sensor Length**
   - Determine sump depth (L_sump).
   - Order a sensor with a length **equal to or just under L_sump**.
2. **Drill Mounting Hole**
   - Drill a hole matching the **float's outer diameter** at a deep, unobstructed location.
3. **Install and Seal**
   - Place the sensor in the hole and **seal with waterproof silicone**.
   - Avoid screws; silicone sealant is sufficient.

See Figure 12: KUS SSS sensor and SPM-010 installation diagram

See Figure 13: SPM-010BC installation with KUS SSS sensor

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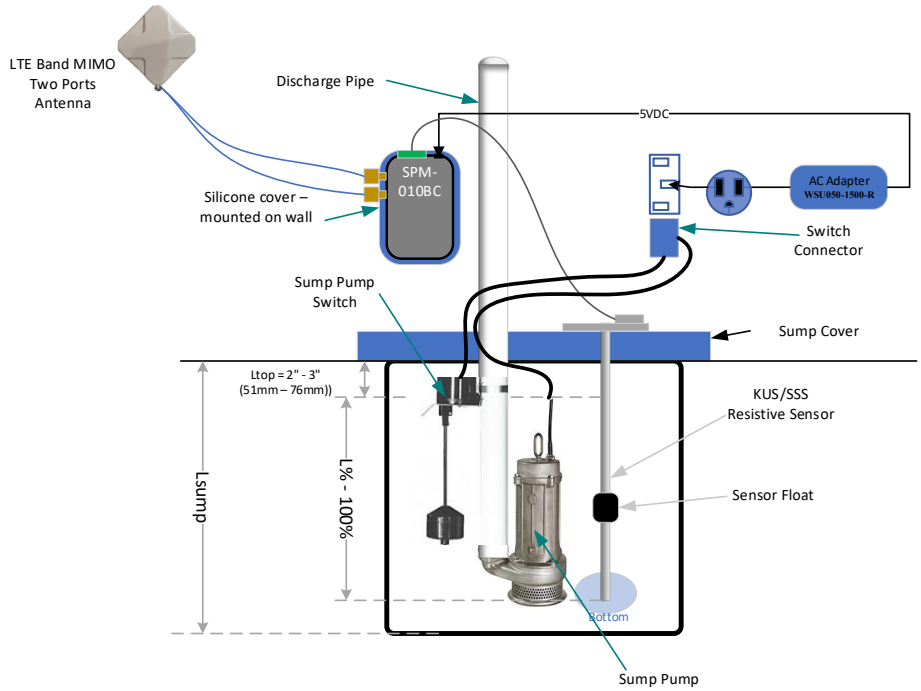

Figure 12 Resistive sensor and SPM-010 Installation

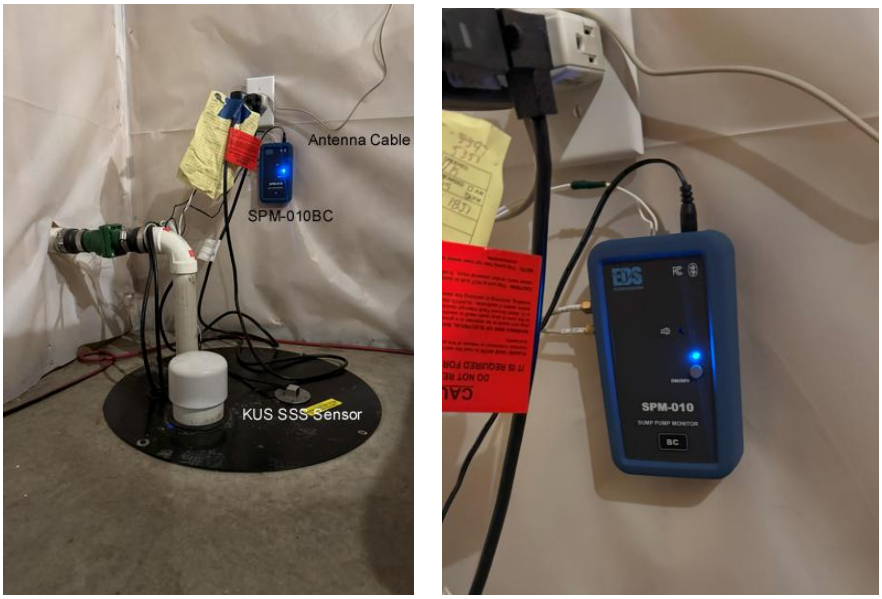

Figure 13 SPM-010BC installation example for Monitoring function with KUS SSS sensor

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Emergency Pump Setup (with SSR-CU Module)

If using an emergency sump pump setup:

- Install the **SSR-CU control module** between the sensor and the pump.
- The resistive sensor (e.g., KUS SSS) is required for this configuration.

See Figure 14: SPM-010/SPM-010BC with Emergency Pump and SSR-CU

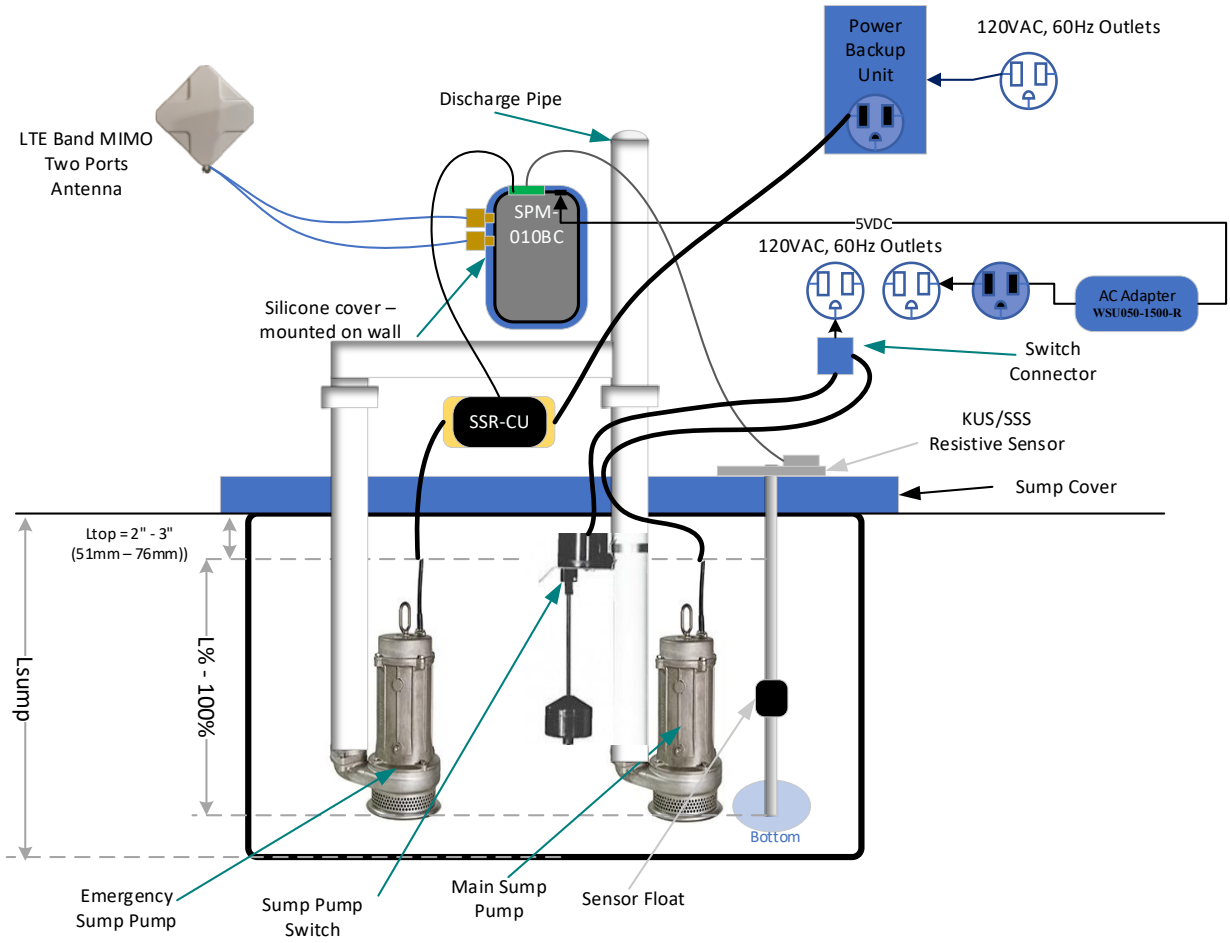

Figure 14 SPM-010/SPM-010BC with Emergency Pump Installation

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Installing the SPM-010 or SPM-010BC Device

Refer to the figures mentioned earlier (Figures 9–14) based on your sensor type.

- Mount the device in a **dry, elevated** area near the sump.
- Ensure clear access to connectors and visibility of LED indicators.
- For **SPM-010BC**, also follow the **Antenna Adjustment** section to ensure strong LTE signal reception (see Figure 37).

Next up: I'll continue with the **Operation** section, including the power-on sequence, dummy battery installation, and front panel functionality.

Let me know if you'd like me to also incorporate icons or styled callouts for tips, notes, or warnings (for example: 💡 Tips, ⚠️ Warnings).

🧭 Operation

Powering On and Basic Use

🔋 Dummy Cell Installation (SPM-010 Only)

Before first use, you must install the included **dummy battery** in the SPM-010 device.

Steps:

1. Remove the silicone protective cover.
   📷 *See* Figure 15*: Removing Silicon Cover*
2. Open the battery compartment on the back.
3. Insert the AA-sized dummy battery into the empty slot.
   📷 *See* Figure 16*: Dummy Battery Installation*
4. Close the cover and reapply the silicone protector.

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Figure 15 Silicon Cover Removing

Figure 16 Dummy Cell Installation

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Device Controls and Indicators

Both models have a simple, intuitive front panel:

- **Power Button** – Turns the unit on/off.
- **LED Indicator** – Blinks approximately every 1.5 seconds during normal operation.

See Figure 17*: Front Panels of SPM-010 and SPM-010BC*

Note: Local sound alarm is available only on older hardware versions (SPM-010 v4).

Figure 17 SPM-010 and SPM-010BC Front Panels

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Using the iOS Application

🔧 Installation

Download and install the **SPM-010 App** from the AppStore on your iPhone or iPad.

📱 Setup for SPM-010 Users

If using a smartphone/tablet for monitoring and alerts:

1. Create a new **Contact** on your iOS device:
   - **First Name**: SPM-010
   - **Phone Number**: Your actual phone number (e.g., +1XXXXXXXXXX)
2. Launch the app. An **activation message** will be sent from the app to the assigned number.

📷 *See Figure 18: Activation Messages*
📷 *See Figure 19: Confirmation Message on Startup*

If SMS alerts are not required, this step is optional.

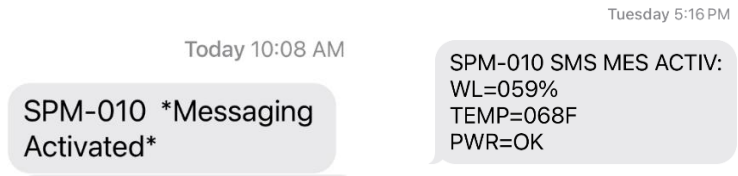

Figure 18 SPM-010 Activation Message and SPM-010BC (in case of LTE is connected) Activation direct SMS message

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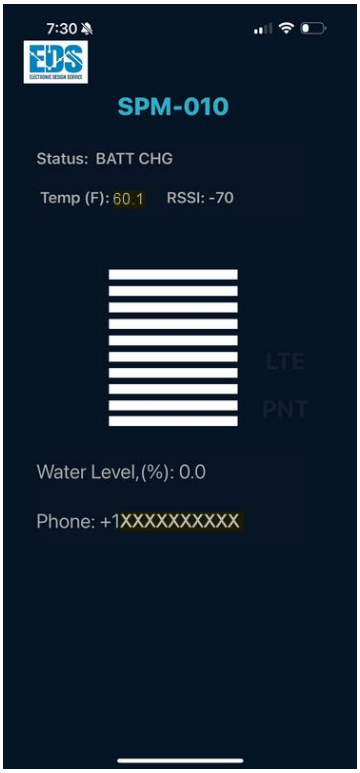

Figure 19 Message Phone number at start (SPM-010 example)

Setup for SPM-010BC Users

The SPM-010BC can send and receive SMS messages **independently**.

- After LTE connection is established, the **activation SMS** is sent automatically.
- You may still pair your smartphone via Bluetooth for local monitoring.
- Create a new contact (see above).
- Use the **PNT Button** on the app (available at startup for 15 seconds) to transfer your phone number to the device.
- Use the **LTE Button** during installation to enter antenna signal strength adjustment mode.

See Figure 20: iOS App – SPM-010BC Version

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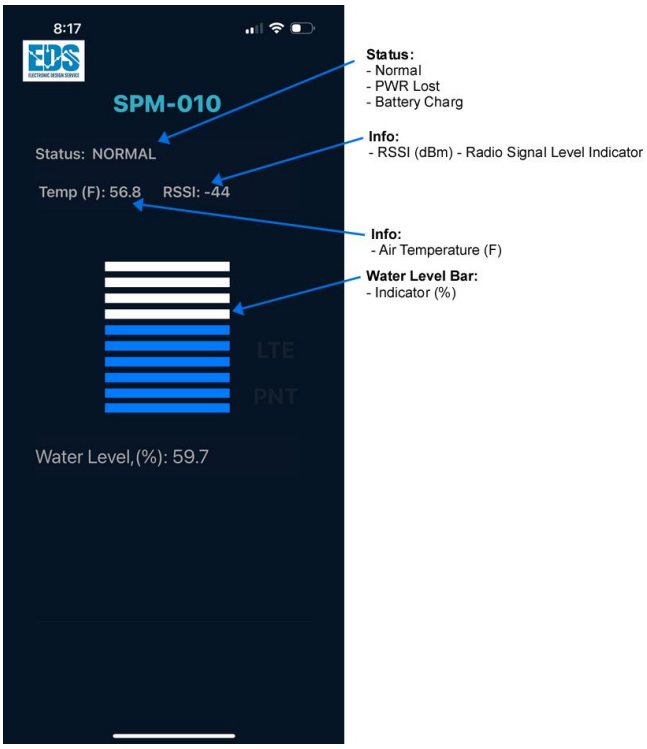

Figure 20 iOS Application Screenshot for SPM-010BC device version.

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📲 Messaging, Alerts, and Operating Conditions

The SPM-010 and SPM-010BC devices notify you of key status changes through visual indicators, in-app messages, and SMS alerts (when configured). Here's how each scenario is handled:

✅ Normal Operation

SPM-010

- Power is connected and stable
- Battery is charging or fully charged
- Water level is below the alarm threshold
- No sound or visual alarms
- Status indicator shows **"Normal"**

SPM-010BC

- Power is connected
- LTE connection is active
- Battery is charging or charged
- Water level is normal
- App shows **"Normal / LTE Connected"**
- No alerts or alarms triggered

📷 *See Figure 19 & Figure 20 for app screen examples*

⚡ Power Loss Condition

When a power outage occurs:

- **Status changes to "PWR LOST"**
- Battery backup keeps the device running
- Water level monitoring continues

SPM-010

- Sends a power loss alert via SMS (if connected to a home device with the Remote Messaging Service)

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See Figure 21: Power Loss and Recovery Messages

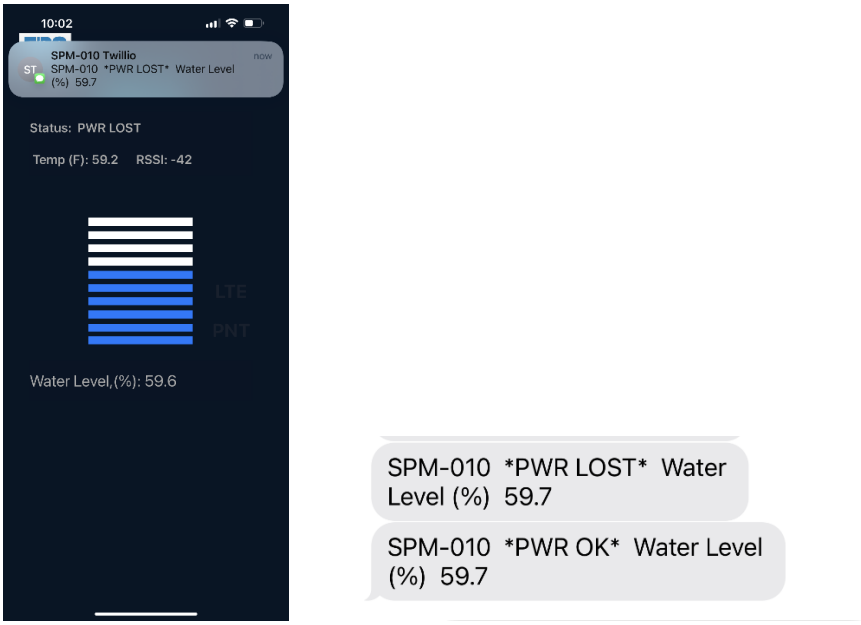

Figure 21 Power Loss Screenshot, Power Loss Alarm message and Power Return Message

SPM-010BC

- Sends SMS directly using LTE
- When power is restored, a **"PWR OK"** message is automatically sent

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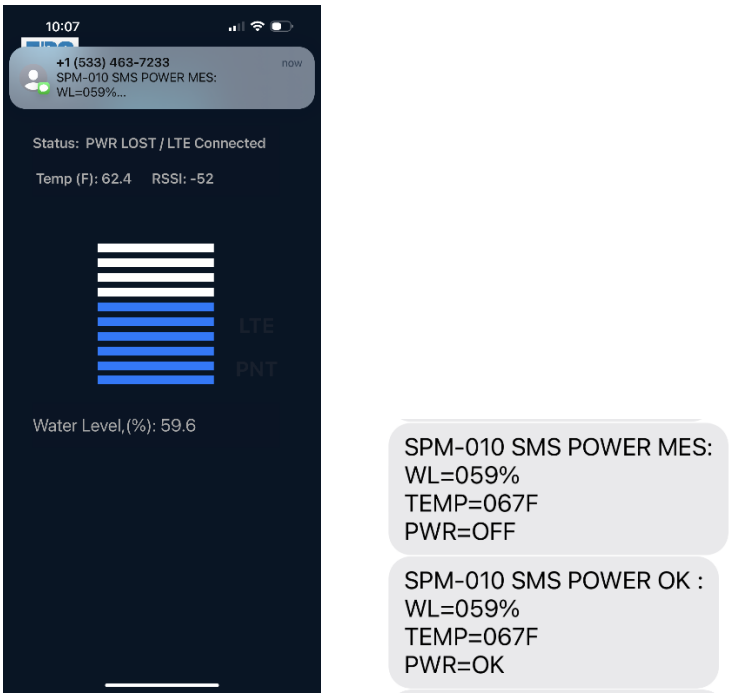

Figure 22 Power Loss Screenshot, Power Loss Alarm SMS message and Power Return SMS Message

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💧 Water Level Alarm

If the sump water level rises above the set threshold:

- The water level bar on the app turns red (above 70% - adjustable)
- A sound alarm is triggered on the paired iOS device (SPM-010)
- SMS alert is sent (SPM-010BC or RMS-enabled SPM-010)

When water drops below 5%, a "**Water OK**" message is sent to confirm normal status.

📷 *See Figure 23 & Figure 24: Water Level Alerts and Returns*

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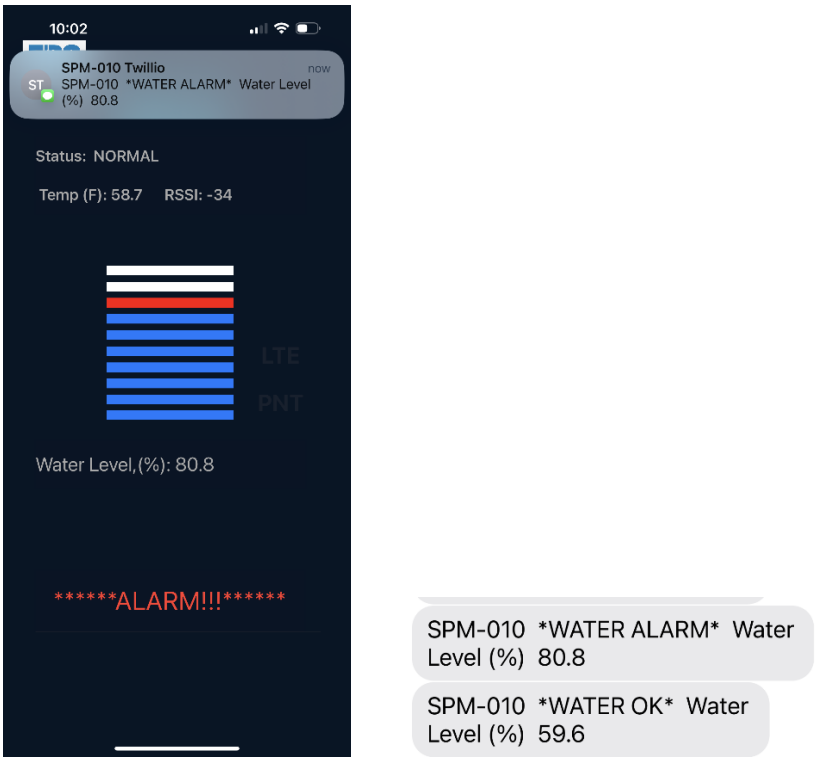

Figure 23 SPM-010 Water Level Alarm Screenshots, Water Level Alarm message and Water Level Return message

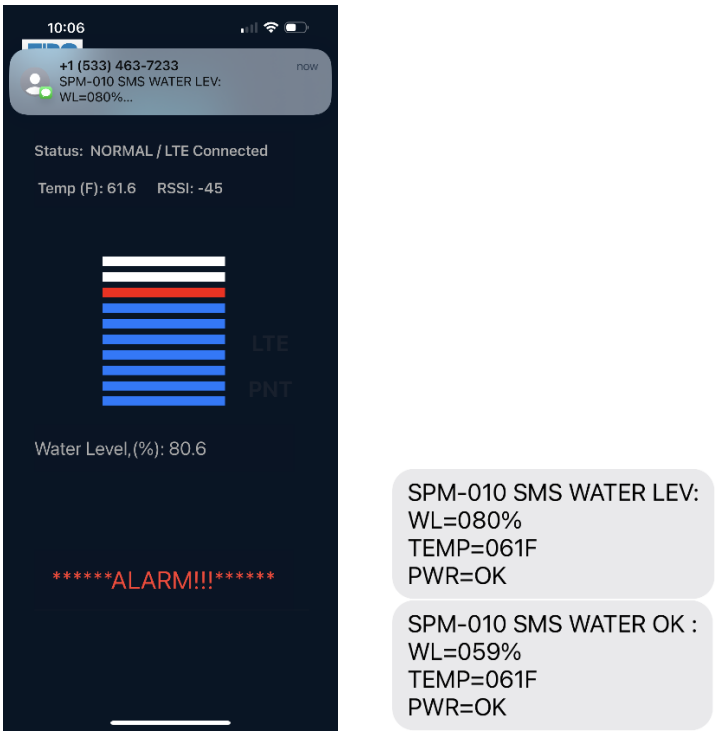

Figure 24 SPM-010BC Water Level Alarm Screenshots, Water Level Alarm message and Water Level Return message

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Battery Charging Status

If the device is operating on backup power but receives external AC power again:

- The device shows **"Battery Charging"** on its status line
- Indicates the unit switched to charging mode after a power loss

See Figure 25 & Figure 26: Charging Indicator Screens

Figure 25 SPM-010 Normal operation with battery charging screenshot

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Figure 26 SPM-010BC Normal operation with battery charging and Activation SMS screenshot

❄️ Low Temperature Alert

If the ambient temperature drops below 45°F (7°C):

- An SMS message is sent with the "**Low Temperature**" alert and the actual reading
- Once temperature rises back above 45°F, a "**Temperature Norm**" message is sent

📷 *See Figure 27: Low Temperature Notifications*

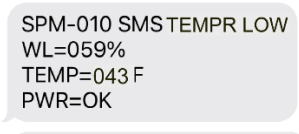

Figure 27 Low Temperature SMS Message (SPM-010BC example)

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📩 Requesting System Status (SPM-010BC Only)

You can query the device by sending an SMS command:

- Text **GD** to the phone number associated with your SPM-010BC device
- The device replies with an SMS showing:
  - Water level
  - Power status
  - Air temperature
  - Device battery state

📷 *See Figure 28: SMS Response with Current Parameters*

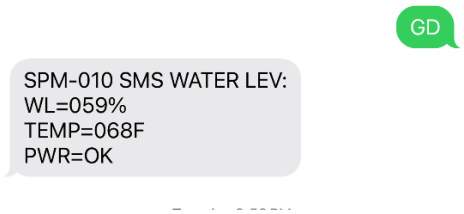

Figure 28 Request Current parameters and response SMS message with current parameters

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🔋 Battery Safety and Handling

The SPM-010 and SPM-010BC both use a **3.7V Lithium-ion protected battery** to ensure uninterrupted operation during power outages.

Safety Features:

- **Overcharge protection**
- **Over-discharge protection**
- **Short-circuit protection**
- **Reverse polarity protection**
- Reinforced steel shell to protect against pressure or impact

Important Guidelines:

- **Do not use the device with a damaged battery**
- **Do not attempt to replace the battery with a non-approved model**
- Battery is rated for approximately **500 charge cycles**
- Store the device in a cool, dry place to extend battery life

⚠️ Always handle batteries with care. Improper use may result in damage or reduce battery effectiveness.

🛡️ Warranty Information

Limited 1-Year Warranty

This product is covered by a **1-year limited warranty** against defects in materials or craftsmanship under normal use.

What's Covered:

- Repairs or replacement due to manufacturing defects

What's Not Covered:

- Damage due to misuse, improper installation, or external events (fire, water, lightning)
- Use with unauthorized accessories or modifications
- Unauthorized repairs or service

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Warranty Procedure:

To request service:

1. Contact the manufacturer or dealer.
2. Provide proof of purchase.
3. Ship the product (freight prepaid) to the authorized address.

Legal Notice:

- This warranty is governed by the laws of the State of Missouri, USA.
- Certain limitations may not apply depending on your local jurisdiction.
- **Warranty is limited to repair or replacement only.** Indirect, incidental, or consequential damages are not covered.

For full legal terms, please refer to the complete warranty document included with your product or visit: www.eldesignservice.com

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🧩 Troubleshooting Guide

◆ SPM-010 Issues

Issue	Solution
Bluetooth won't stay connected	Ensure the iOS device is within range (RSSI > -90dBm). Reconnection may take up to 6 minutes.
Bluetooth won't connect	Go to iOS Settings > Bluetooth, tap on SumpPumpMonitorV010, and select "Forget This Device." Then restart both the SPM-010 and your phone.
No activation SMS sent	Double-check the contact entry in your iOS device (see app setup instructions).
Incorrect water level readings	Restart the device if WS-010 was recently calibrated. For KUS sensors, ensure the correct sensor type is selected in settings.

◆ SPM-010BC Issues

Issue	Solution
Bluetooth issues	Follow the same steps as above for SPM-010.
No SMS responses	Ensure the device has a valid LTE signal and SIM card. Recheck phone number transfer.
No alarms or alerts	Verify that the correct threshold settings are applied and sensors are installed properly.

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📘 Appendix A: Bluetooth Scanner & Sensor Calibration

This section covers the use of a BLE (Bluetooth Low Energy) scanner app for configuring the SPM-010, including how to perform WS-010 sensor calibration and set resistive sensor parameters using the TI SimpleLink Starter app.

🔍 Using a Bluetooth Scanner Application

A BLE scanner app allows you to connect directly to the SPM-010 and SPM-010BC for configuration and diagnostics.

Recommendation is to use TI SimpleLink Starter App:

- **App Name:** *Bluetooth BLE Scanner*
- **Platform:** iOS (iPhone or iPad)
- 📷 *See Figure 29: Recommended Bluetooth Scanner iOS Application*

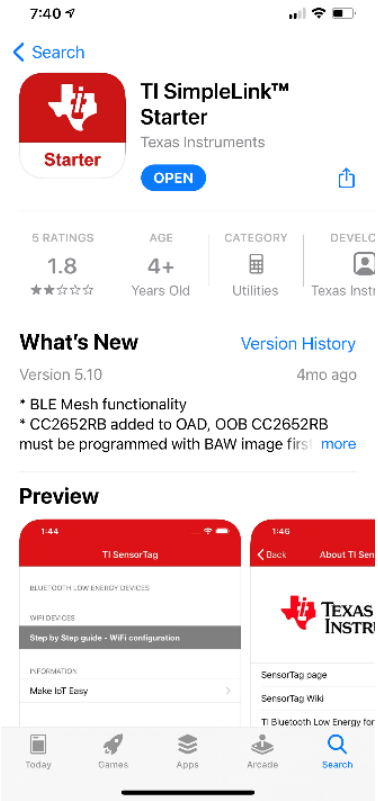

Figure 29 Recommended Bluetooth Scanner iOS Application.

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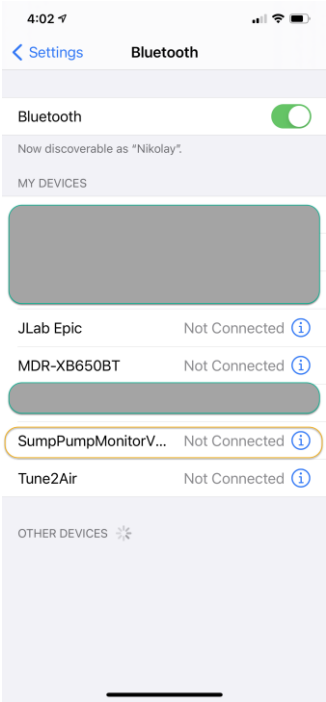
Steps:

Note: If you have previously paired any SPM-010 device, go to Settings>Bluetooth and remove it from list (see Figure 30) by using Forget This Device option

1. **Download and install** the BLE Scanner app from the App Store.
2. **Open the app** and scan for nearby BLE devices.
3. Look for a device named **SPM-010** in the list.
4. Tap to connect, then navigate to the **Service Explorer**.
5. Choose the **"1 – TI Simple Key Service"** and then select **"0 – Key Press State"**.
6. Use the "Enter Value" field to write commands to the device.

See Figure 30: Device Scan Example
See Figure 31: Service List
See Figure 33: TI Services Available
See Figure 33: Writing a Command



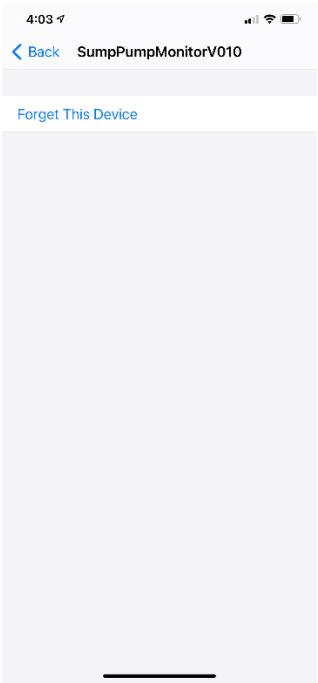


Figure 30 Screenshot Example

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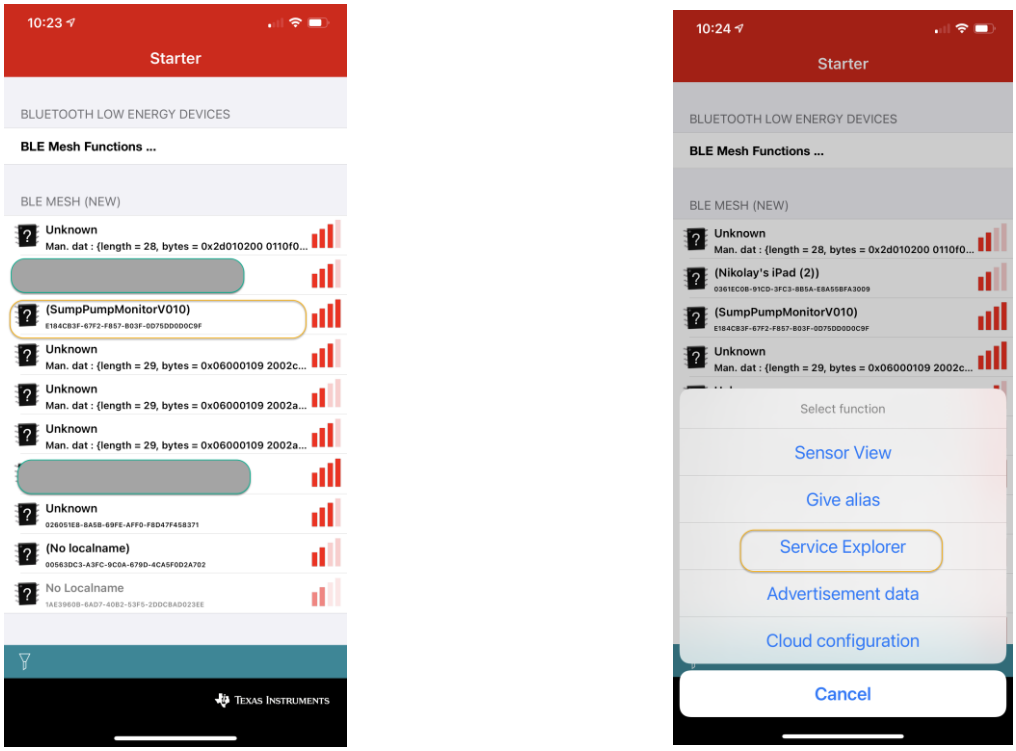

Figure 31 List of devices and Services

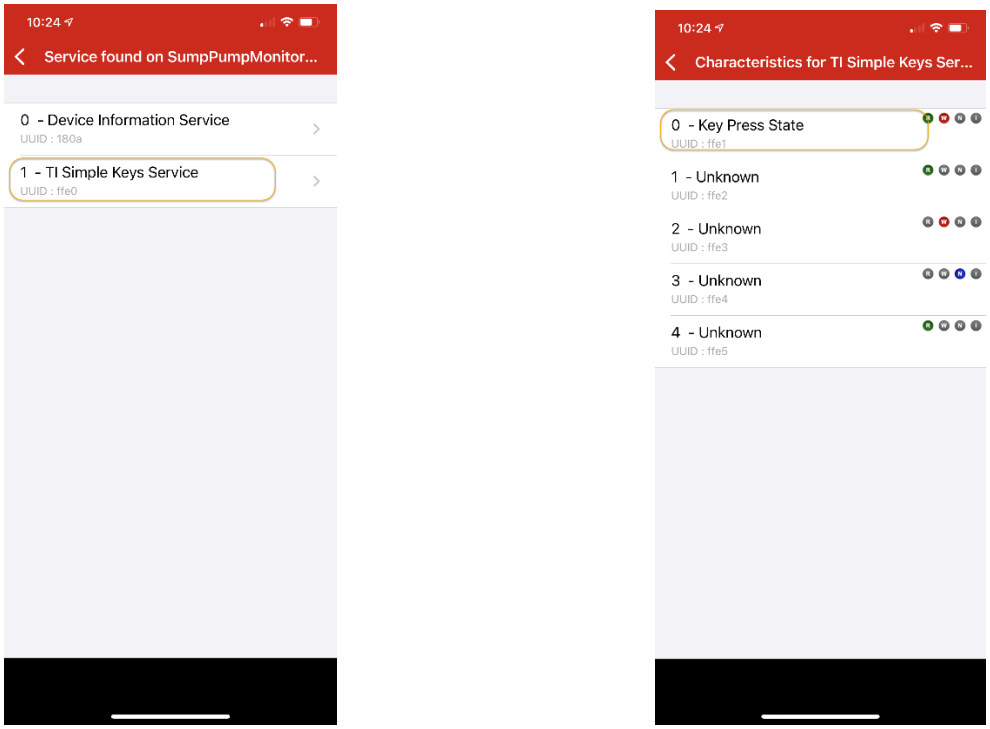

Figure 32 Services

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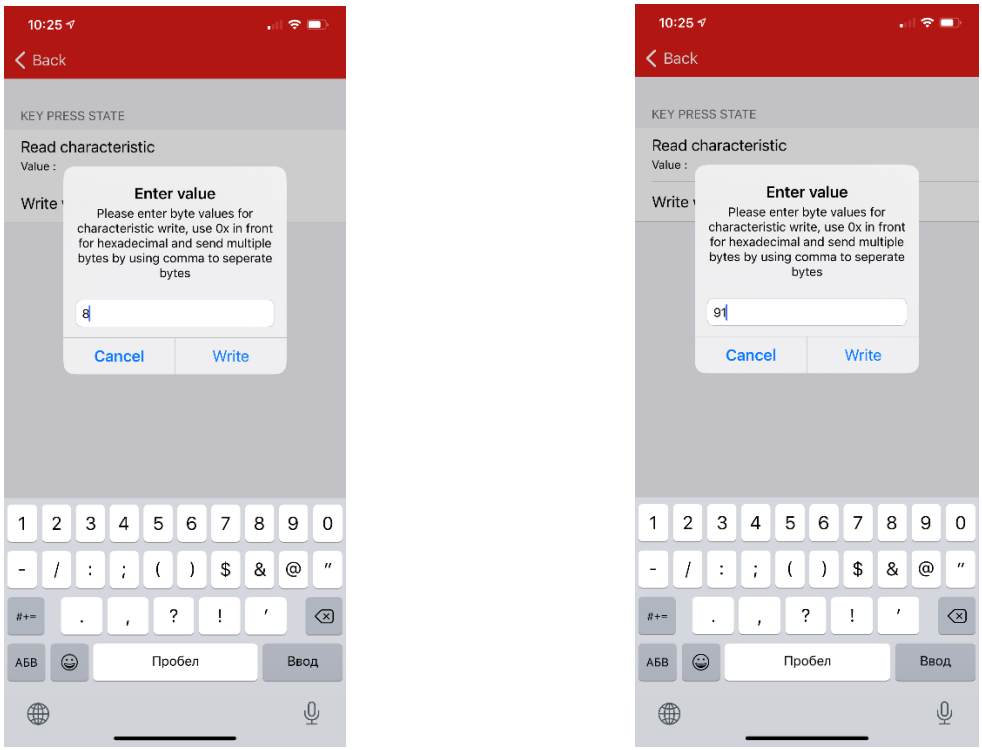

Figure 33 Command Write Example

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⚙️ WS-010 Sensor Settings and Calibration

If you are using the WS-010 wire sensor, you may need to calibrate it if the default settings do not match your sump depth.

Default Calibration Settings:

- **0% Water Level:** 0 mm (sensor dry)
- **100% Water Level:** 30" (762 mm)

If your installation differs, recalibrate the sensor using the BLE Scanner and WS-010 Sensor Calibration Instruction. Document is provided by:

https://eldesignservice.com/home-monitors/home-monitors-2/

🔧 Resistive Sensor Configuration (KUS SSS Sensor)

Default Settings:

- **240 Ohms = 0% water level (empty)**
- **33 Ohms = 100% water level (full)**

This type of sensor does not require calibration.

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📘 Appendix B: SPM-010BC Special Operation Modes

This section outlines advanced configuration features unique to the **SPM-010BC**, including how to transfer a messaging phone number to the device and how to optimize the LTE antenna placement for a reliable cellular signal.

📞 Phone Number Transfer to SPM-010BC

For the SPM-010BC to send and receive SMS alerts, it must store a valid **destination phone number**. There are two ways to assign this number to the device:

Method 1: Using the Smartphone App (Recommended)

Steps:

1. **Ensure your smartphone is connected** to the SPM-010BC via Bluetooth.
2. Add the target number to your iPhone/iPad Contacts:
   - **First Name:** SPM-010
   - **Phone Number:** +1XXXXXXXXXX (the number to receive SMS)
3. Open the **SPM-010 App**. Wait until the **status bar** displays:

   Normal / LTE Connected

4. The **PNT Button** (Phone Number Transfer) will appear **for 15 seconds**.
5. Tap the **PNT button** once and wait **20–30 seconds** for the number to be saved.
6. After success, the app will return to the main monitoring screen automatically.

📷 *See* Figure 34*: Transferring Number via App Interface*

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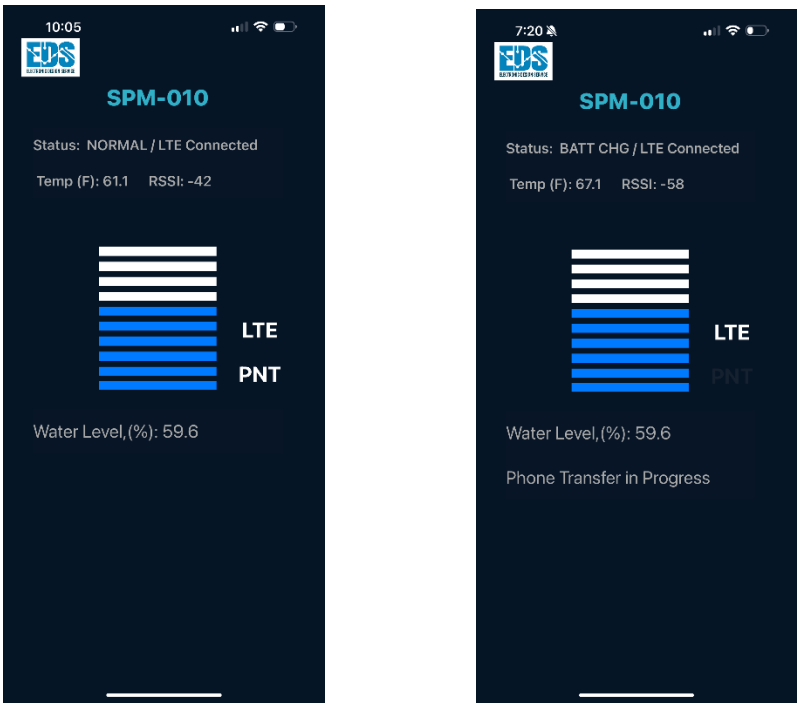

Figure 34 Phone Transferring Mode by using SPM-010 application

Method 2: Using the TI SimpleLink Starter App

This method allows you to manually send configuration commands to the SPM-010BC.

Prerequisites:

- TI SimpleLink Starter app installed
- BLE connection to SPM-010BC established
- Familiarity with command input format

Steps:

1. Connect to the device via **TI SimpleLink Starter**.
2. Navigate to:
   - TI Simple Key Service > Key Press State
3. Send the command sequence required to store the phone number.

📄 Refer to Table 1 for the full command list.

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📡 LTE Antenna Location Adjustment

Proper LTE antenna placement is critical for the SPM-010BC to maintain reliable connectivity for remote SMS alerts.

Goal:

Achieve a **signal strength better than -100 dBm** during initial installation.

📶 Signal Optimization Mode ("LTE Mode")

How to Enter LTE Mode:

1. Open the **SPM-010 App** on your iOS device.
2. Wait for the status to show: Normal / LTE Connected
3. The **LTE Button** will appear (active for 10–15 seconds).
4. Tap **LTE Button** once to enter signal strength display mode.
5. The app will now show the **LTE RSSI value**.

Adjust the Antenna:

- Slowly reposition the antenna until you achieve a signal better than **-95 dBm**
- Wait for the RSSI to refresh (may take up to 30 seconds)
- Once optimal, tap **LTE Button** again to return to standard operation mode

📷 *See Figure 35: LTE Antenna Adjustment Mode Interface*

📌 For best results, keep the antenna away from concrete walls, metal enclosures, or any sources of electrical interference.

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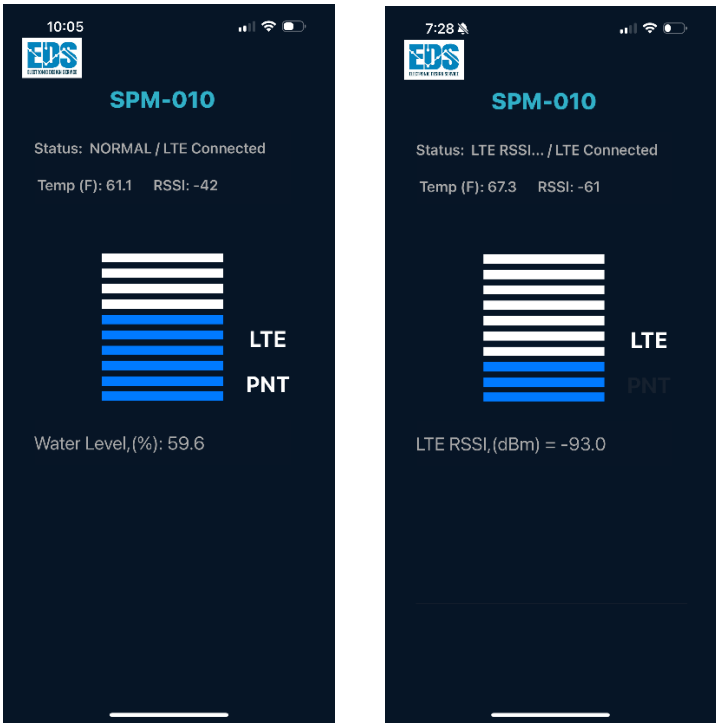

Figure 35 LTE Operation Mode

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The series of commands need to be sent for phone transferring (see Table 1)

Table 1 Phone Transferring Commands

Command	95	Country Code = 1											
					Phone Number Digits:								
Area Code	**Example**		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	
D1	4		96	97	98	99	100	101	102	103	104	105	**Area Code D1 Command**
D2	5		106	107	108	109	110	111	112	113	114	115	**Area Code D2 Command**
D3	4		116	117	118	119	120	121	122	123	124	125	**Area Code D3 Command**
Phone Number													
D1	1		126	127	128	129	130	131	132	133	134	135	**Phone Number D1 Command**
D2	2		185	186	187	188	189	190	191	192	193	194	**Phone Number D2 Command**
D3	4		195	196	197	198	199	200	201	202	203	204	**Phone Number D3 Command**
D4	5		205	206	207	208	209	210	211	212	213	214	**Phone Number D4 Command**
D5	4		215	216	217	218	219	220	221	222	223	224	**Phone Number D5 Command**
D6	3		225	226	227	228	229	230	231	232	233	234	**Phone Number D6 Command**
D7	2		235	236	237	238	239	240	241	242	243	244	**Phone Number D7 Command**
Command	1	Go to operation											
To transfer 1 454 124 5432 phone number example the following series command shall be used:													
94	95	100	111	120	127	187	199	210	219	228	237	1	

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