RAK Winter Operation Guide for Solar and Battery Systems

This document provides standardized guidance for RAK's global customers to help ensure reliable system performance, battery longevity, and operational stability under cold weather conditions.

1. Introduction

For RAK Edge and RAK Soho gateways powered by solar and battery systems operating in environments below 0 °C, this guide outlines best practices to:

• Maintain system stability,
• Protect the battery, and
• Mitigate risks associated with snow coverage, low temperatures, and reduced solar charging efficiency.

2. Solar Panel Installation Recommendations

2.1 Angle and Orientation

During winter, the sun's elevation angle is lower. To maximize sunlight absorption:

• Increase the tilt angle of the solar panel by 5–10° above the local latitude.
• Face the solar panel true south in the Northern Hemisphere, or true north in the Southern Hemisphere.
• Avoid shading from trees, buildings, or other obstructions throughout the day.

2.2 Snow and Dust Protection

For installations in snowy regions:
• Set the panel tilt angle to 10° above the local latitude to allow snow to slide off naturally.
• Regularly clear snow or dust from the panel to prevent shading that may interrupt charging.

2.3 Increasing Power Redundancy

In locations with shorter sunlight hours, it is recommended to:
• Use two solar panels — the RAK Battery Plus System supports dual PV inputs.
• Alternatively, use a single 120 W panel.
(Note: The default panel in the RAK Solar Panel Kit is 80 W.)

3. Battery and Heating System Maintenance

3.1 Battery Heating and Discharge Logic

RAK's battery systems include a heating film and temperature sensor, controlled by logic that prioritizes heating during low-temperature conditions to maintain safe charge/discharge performance.

In cold weather:
• Heating consumes a significant portion of available solar energy, reducing effective charging time.
• When sunlight is insufficient, the system may enter a state where charging energy < total consumption (gateway + heater).

> Note: The heating element in RAK Battery Systems draws power directly from the solar panel and does not use the battery's stored energy.

3.2 Monitoring and Intervention Guidelines

Key parameters to monitor:
• State of Charge (SoC) falling below 50%,
• Charging current remaining low or continuously decreasing,
• Battery temperature approaching the lower operational limit (typically around –20 °C).

Manual intervention is recommended when:
• SoC continues to decrease over time,
• The battery cannot reach the required temperature to restore charging, even with the heater active,
• The gateway frequently powers off or reboots due to power shortages.

Suggested actions:
• Temporarily increase solar panel capacity or connect an external power source,
• If sunlight is unavailable for extended periods, remove the battery and store it indoors at room temperature,
• Use the Service Power Adapter to fully charge the battery before redeployment.

4. Pre-Winter Preparation

4.1 Battery Temperature Curve Calibration

Before winter begins:
• RAK can provide calibrated firmware for the Battery System to match specific deployment needs.
• RAK may request environmental parameters from the user to ensure the updated temperature curve aligns with actual site conditions.

Maintaining an accurate temperature profile helps prevent overcharge or over-discharge during extreme cold.

5. Remote Monitoring and Support Services

RAK currently offers free remote operation and maintenance monitoring services (pilot stage) for VIP customers managing gateway fleets with WisDM.

Customized monitoring reports can include:
• Battery temperature, current, voltage, and SoC trends,
• Gateway operational status and power consumption,

• Solar charging efficiency over time,
• Early warnings for abnormal conditions (e.g., prolonged lack of charging, persistently low battery temperature).

To activate this service or request customized reports, please contact your RAK sales representative or technical support team.

6. Conclusion

For winter deployments, stable performance depends on:
• Optimizing solar panel orientation and capacity,
• Continuously monitoring battery health and temperature,
• Taking proactive measures, including providing backup power when necessary.
By following these guidelines, you can maximize the uptime and reliability of your solar-powered RAK gateway deployments during the winter season.