TECHNICAL BULLETIN

Intrusion — wLSN Wireless Devices

Low Battery Information — March 4, 2010

Issue Severity:	Products Affected:
☐ **High:** Act immediately	All wLSN Premises Wireless Devices
☐ **Medium:** Bosch Security Systems, Inc. strongly recommends you take the action(s) described below.	
☒ **Low:** Advisory	

1.0 Issue

Bosch wLSN devices are designed to provide the highest level of communication reliability possible within a given operating environment, in the most energy-efficient manner possible. There are several factors, however, that might influence when a wLSN device reports a low battery condition. This bulletin describes the battery technologies used in wLSN devices, the proper method of determining a battery's capacity, and provides descriptions and corrective actions for the common scenarios for low battery reports.

Battery Technologies and Voltage Measurements

wLSN devices use two battery chemistry technologies: **alkaline** and **lithium**. Each technology has its own capacity and discharge characteristics.

Alkaline batteries have a linear discharge rate, where the battery voltage drops proportionally to the energy consumed by the device. During a device's transmit and receive cycles, the voltage of alkaline batteries drops slightly and then recovers to nearly the same voltage as before the transmit and receive cycle.

Lithium batteries have a quick initial voltage drop from 3 V down to approximately 2.7 V, after which the voltage remains nearly constant until the battery has delivered 90% of its total capacity. During a device's transmit and receive cycles, the voltage of lithium batteries can drop significantly and then recover back to 2.7 V. Unlike alkaline batteries, when a depleted lithium battery is removed from a product, its voltage is still relatively high, even though it cannot supply the energy required to operate the device.

For both battery technologies, the battery voltage during transmit and receive cycles is lower than during idle periods. Because of the short duration of the wLSN transmit and receive cycles, standard volt meters disregard these voltage drops and therefore do not provide an accurate battery capacity reading.

Determining the Remaining Capacity of a Battery

The best method for measuring the remaining capacity of a battery is to use a battery load tester. Battery load testers typically have settings for measuring different battery technologies, and they display remaining capacity as a percentage of full capacity (for example, **60%**).

Recommended Battery Tester:

Pulse Load Multi-Battery Tester
Model MBT-1
ZTS, Inc.
www.ztsinc.com

Batteries that have been removed from a device for a period of time can show a recovery of capacity when first measured on the battery load tester. It is therefore good practice to measure the battery twice, with only 8 to 10 sec between the first and second measurements. Use the second measurement as the capacity reading.

wLSN devices can operate at voltages down to 2.4 V. Below 2.4 V, radio communication cannot be maintained. This cut-off voltage reduces the available battery capacity to 90% for lithium batteries and 45% for alkaline.

The following table shows the required capacity for each battery technology to support various battery life expectancies in a system with no issues, such as poor RF communication or excessive RF noise.

	Remaining Battery Life			
	2 years	**1 year**	**1 month**	**Unusable**
Lithium	60%	30%	20%	10%
Alkaline	80%	65%	50%	40%

2.0 Resolution

The following table describes the various wLSN device low-battery symptoms, causes, and solutions.

Symptom	Troubleshooting Questions	Troubleshooting Answers	Corrective Actions
More than 1 year from installation time, and low battery is reported during normal system operation.	Did the device report missing before the low battery report?	**YES:** The device is likely experiencing intermittent communication link problems with the hub.	1) Measure device signal strength as described in the *wLSN Signal-to-Noise Ratio Values Technical Bulletin* (P/N: TBI 07-31-09_wLSN_SNR-02). If signal strength does not meet acceptable levels, install a Diversity Hub. 2) Re-measure device signal strength after installing the Diversity Hub. If signal strength does not meet an acceptable level, remove the device and replace with a wired device.
		NO: This is normal battery depletion. The device might operate normally for 1 to 2 weeks after a low battery report before reporting as missing.	Replace batteries.
Less than 1 year from installation time, and low battery is reported during normal system operation.	Did device report missing within 24 hours of the low battery report? Does the control panel indicate intermittent missing or jamming reports for this device?	**YES:** The device has a poor RF communication link with the hub.	1) Measure device signal strength as described in the *wLSN Signal-to-Noise Ratio Values Technical Bulletin* (P/N: TBI 07-31-09_wLSN_SNR-02). If signal strength does not meet acceptable levels, install a Diversity Hub. 2) Re-measure device signal strength after installing diversity hub. If signal strength does not meet the acceptable level, remove the device and replace with a wired device.
		NO: The device is experiencing excessive RF noise.	Replace batteries and provide site details to Bosch. If there are other radio devices operating in the 868 MHz or 433 MHz frequency bands, relocate or power off those devices.
Low battery reported at system power up.	Has the control panel or hub been without power for more than 8 hours? Does the control panel history indicate AC failure, AC restoral, and point restoral?	**YES:** This is normal behavior for wLSN devices. The device has consumed all of the available battery energy while trying to re-connect with the hub, which is powered off.	Replace batteries.
		NO: Battery was near end of life prior to the power outage.	Measure the capacity of the batteries, and determine usability based on the remaining battery life chart (above). Replace as necessary.

If none of the above symptoms describe your low battery scenario, and the Low Battery Report occurs within 6 months of installing fresh batteries, send the wLSN device back to Bosch.