

Hikvision Solar Camera Battery Management

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BACKGROUND

The Hikvision Solar-Powered Security System provides a standalone wireless security system used for remote or hard to reach areas without a network or power that still require surveillance. The camera system uses intelligent battery tracking to help you manage battery power remotely to ensure a consistent power supply to your camera system. In this white paper, we will provide a detailed overview of how the battery management component works within our Solar-Powered System to ensure sufficient power to meet surveillance needs.

INTELLIGENT BATTERY LIFE TRACKING TECHNOLOGY

The Hikvision camera uses the battery fuel gauge impedance tracking technology to calculate the remaining battery life. The technology uses a self-adaptive algorithm that can remember the battery change during its usage and acquire accurate battery life by combining the algorithm and the battery chemical properties. There are two systems integrated in this technology:

1. Open Circuit Voltage Method: Users can determine the battery life by using the open circuit voltage look-up table. The battery aging changes under different power loadings, different temperatures, and the battery voltage and life also change dynamically. To get accurate information, correction is necessary in accordance with the actual temperature and battery lifespan. This method is more suitable for systems with constant power loading.
2. Coulomb Counting: Check the real-time electric current and voltage to apply them in an integration formula for the final battery use. This method is more accurate because it can calculate the entire battery life and is suitable for the full charging and discharging situation. The greater the current it discharges, the more accurate the calculation. It is not suitable to calculate the battery life when the camera is in low power loading for a long time period as the variance may grow. Compensation calculation is necessary by introducing the open circuit voltage method to improve the overall accuracy.

BLACK BOX DESIGN FOR HISTORICAL BATTERY EXCEPTIONS

The battery contains a black box (512 KB FLASH) which can track abnormal temperature, short circuit protection, charging overcurrent, discharging overcurrent, and over voltage protection. The system's built-in RTC chip can record the date. The master computer and the master camera can retrieve this information remotely. If the battery fails, the black box can track the battery's historical exceptions. The maximum number of recorded logs allowed is 3,270 and each log contains the time that the exception occurs (accurate to seconds), the current protection status (overvoltage, undervoltage, overcurrent, over temperature, low temperature, short circuit and Analog-Front-End (AFE) chip exception), the current voltage, current temperature, and battery power.

REPLACEABLE STANDARD BATTERY

The battery is in-built with a Hikvision-defined protocol that allows it to get connected through the RS-485 port and offering access to the camera for battery capacity check. The camera system can recognize different batteries intelligently and ensure the accuracy of the battery power check. If a battery does not support such protocol, e.g. a non-Hikvision battery, the battery power may not be accurately read and the battery data won't be retrievable, leading to miss-management, or power-off by misjudgments.

LOW BATTERY SELF-DEPLETION FOR LONG BATTERY LIFE

The Hikvision battery has a very low battery self-depletion, which means it has an extended capacity and can be stored for a long period of time while remaining in good condition. If the battery is not used for communication, it will remain in standby mode. We also adopt the battery fuel gauge, protective chip, and impedance tracking technology to reduce battery depletion.

The battery management system (BMS) design considers factors that affect battery self-depletion and work to reduce depletion. Due to this, users will not receive a system with a completely depleted battery upon receipt due to long-term storage, transportation, or any other reason. The major advantages of this design are as follows:

1. Customized Solar Charge Controller: The traditional controller consumes 10 milliamps (mA) even when the controller is not connected to the solar panel. The energy consumption is rather high (0.1 watt) for a complete system. Based on the same equipment and settings, using our low power solar charge controller can improve the battery life by up to 10%, according to our tests.
2. Ultra-Low-Power Microcontroller Unit (MCU) Control Chip: This design adopts ultra-low-power mode to make sure the device performs well in active mode or standby mode, efficiently using battery energy.
3. Low Power RS-485 Circuit with a Unique Design: The circuit design we adopted can ensure the power is thoroughly cut off during non-communication status. Furthermore, the RS-485 circuit is separately placed so that the battery will not be burned if a short circuit occurs to the signal cable and the battery.
4. Adopts Analog-Front-End (AFE) Chip. As the core of the battery design, this chip can ensure low power and high reliability.

BATTERY INSULATION TECHNOLOGY

The battery insulation technology we've adopted helps protect the interior of the battery from high temperatures. The battery adopts an aluminum case that will not be damaged, even during fires. We also adopted the pressure relief valve to balance the internal and external air pressure to prevent explosion due to high internal air pressure. The battery is IP67 waterproof rated. The major advantages are as follows:

1. The battery chip is supported by the internal bracket to protect the battery from force caused by vibration and to prevent extrusion between batteries.
2. The wrapper between the battery and the case includes not only the EVA foam for a buffer, but also FR4 (a NEMA grade designation for glass-reinforced epoxy laminate) material for additional support. FR4 material can also function as heat insulation and a flame retardant and maintain its original shape under high temperatures.
3. The battery is rated IP67 waterproof and is equipped with a pressure relief valve to prevent case explosion and potential injury due to the imbalance between internal and external air pressure caused by unforeseeable forces of nature.

To learn more about Hikvision's Solar-Powered Security System, contact your local representation or visit this link: <https://us.hikvision.com/en/catalogs-brochures/flyers>.

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