The design of battery performance monitoring circuit

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Abstract. With the continuous development of new energy technology, power system automation level unceasing enhancement, the battery energy has been widely used in daily production and life. Through constructing monitoring circuit for voltage, current and temperature of the battery parameters acquisition, and then with the standard parameter, realize the battery health degree of judgment, fault battery timely pick and good environment for the safety of the battery stable power supply.

Keywords: Modular, Single chip micro-computer, Monitoring circuit

1 Introduction

At present, battery performance monitoring system has two types: Relay Inspection Monitoring Technology and Distributed Computer Monitoring System. And major foreign use integrated on-line condition monitoring system. Monitoring technology is mostly for monitoring of battery monomer, and monitoring device for battery research design case is less. Individual battery monitoring device can realize real-time monitoring function of the battery pack, but the system is big, costly, and it can't very good implementation in widely used. To solve above problems, the battery performance monitoring circuit is designed in this paper through the general structure, hardware circuit design, solve the problems of the system big, costly, monomer battery online real-time monitoring, raising the security and stability of the battery power supply.

2 The overall structure design

Based on the modular thought, comprehensive battery performance monitoring requirements, design the overall scheme of the battery performance monitoring circuit, mainly including as shown in figure 1, such as collection module, monitoring module, control module and communication module 485.
3 Each module function

3.1 Acquisition module

Acquisition module has completely isolated between batteries, battery, and system function. The dielectric strength of up to 2500V, to ensure the security of the system is reliable. Inspection for UPS battery data, built-in CPU work independently. With current monitoring circuit, temperature monitoring circuit and voltage monitoring circuit, realizes the conventional current, temperature and voltage of online real-time measurement.

1. Current monitoring circuit selects the current sensor ACS752 technology, because of its low cost, low power consumption, high precision to solve linear proportion to the current signal into voltage signal. As shown in figure 2.

2. Using DS18B20 temperature monitoring circuit chip multi-point temperature acquisition on batteries. The chip adopts the single bus protocol, directly to the environmental temperature is converted into digital signals. Serial output in digital code way, simplify the sensor and the interface of the microprocessor, effective measure temperature signal into a voltage signal.
3. Voltage monitoring circuit selects the differential amplifier measurement method, compared to other solutions, differential amplifier method of high precision, less peripheral circuit, high reliability.

3.3 Control module

Control module is the core of battery monitoring system, adopting MSP430 single chip microcomputer as control achieve the function of UPS battery monitoring chip in guarantee the analysis of large amounts of data processing at the same time, also save the query to the data. When the voltage acquisition module voltage signals to the control module, electronic switch will be read for each battery voltage. And then sent to the A/D chip, converts voltage analog signals to digital signals, the digital signal analysis was taken to the CPU processing again, and sent to the display panel.

In the monitoring state, the system will run monitoring program. For each battery voltage, battery temperature and battery charging current for interpretation prompt to beyond the threshold voltage of battery alarm. In the condition of discharge, System run discharge monitoring program, monitoring of each section of the battery discharge characteristics. Comparing with the setting mode, for good or bad for interpretation of the battery, and the results output the results to prompt alarm failure batteries.

3.4 Communication module

Choose the RS-485 communication port, it is a kind of transmitter more standard, allows a transmitter drive multiple load device, load equipment can be a passive transmitter, receiver, or transceiver composition unit. Implement multiple drives in the data transmission and receiver share the same transmission line more applications. The system is stable and reliable in the test, easy to use. This design is MS430 microcontroller based RS-485 communication. As shown in figure 5.

![Diagram of MS430 microcontroller based RS-485 ports](image-url)
4 Conclusions

In this paper, the monitoring circuit is designed based on the modular thought, through constructing in battery performance monitoring circuit for the battery monomer battery current, temperature and voltage measurement. With standard parameters, complete battery performance. In addition, the circuit has strong extensibility, implementation of UPS battery online real-time monitoring; provide the basis for future expansion into general monitoring system.

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