FUNCTIONAL MODULES OF HARDWARE AND SOFTWARE FOR REMOTE MONITORING OF ENERGY SYSTEM INDICATORS OF HYBRID ENERGY SUPPLY SOURCE

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Abstract: Wide-ranging scientific research is being carried out on methods of processing output electrical signals in the form of voltage and their remote monitoring, as well as solving the problems of creating intelligent systems of automatic control with the help of software tools. In the implementation of these tasks, it is considered appropriate to develop a project of a model and hardware-software tools to use the most effective methods of remote monitoring of existing systems in the monitoring of energy systems with hybrid energy sources.

Key words: Automation, production, technological processes, Energy control and calculation automation systems, technological waste.

The architecture of the resource status monitoring complex consists of functional blocks, and each block is designed to perform special tasks. The researched complex consists of various modules and they include signal conversion devices and software.

The device developed and researched for use in remote monitoring of hybrid energy supply sources is designed to perform precise, reliable and fast signal delivery tasks.

In the remote monitoring of hybrid energy supply sources, the signal transmission unit performs the main task of transmitting information about the

current state of energy supply sources to the system monitoring program in multi-parameter signal change processes. The structure of the converter of the primary currents of energy sources into a signal is selected taking into account the structural characteristics of the current-carrying device located on a magnetic base. At the same time, it is necessary to take into account the magnetic conductivity, resistance to aggressive or wet environment, and the effect of heat. Arduino and STM32 microcontrollers were compared and the most optimal one was selected for the monitoring of energy supply devices, mainly the state of changes in the device's operation and its control. In the implementation of monitoring processes, the devices used to process the analog signals coming from the sensors and send them to the electronic platform, designed for remote monitoring through the network, are divided into the following.

Sensors. ACS712 is a current meter that works in both alternating current and direct current. This device provides an analog output voltage at 5 V and proportional to the rated current. This device consists of integrated circuits.

The output voltage of this device is positive, and the current is characterized by the copper conductivity of the primary winding. The internal resistance of the load current is 1.2 Ohm.

The output signal of the device has an analog appearance, so it can be directly measured with a voltmeter and connected to the Atmega328 microcontroller through the analog pin and ARO. Provides an output voltage of 0 to 5 volts in operation for monitoring multi-parameter signals in research work. The output voltage is measured in the ACS712 current device. An Arduino NANO is used to supply 5V to the ACS712 (5V pin on the ACS712). The base of the ACS712 device is connected to the Arduino NANO.

For measurement, a voltmeter is connected to the analog output of ACS712. The device was tested by giving 12 measurement points of input range 2A to 2A. The voltage value of each corresponding measurement is shown as follows. As a result of studies based on the energy consumption of information communication objects of the ACS712 current converter, the size and graph of the output voltages mentioned below were given.

The main requirements for the sensing part of the multi-parameter primary current change sensor are: high sensitivity, high speed, ease and efficiency of installation with an insulating base, small dimensions, weight and price.

The high sensitivity, small size and high speed of the sensitive part make it very convenient to create a monitoring device for electric power supply and to place the changing part on insulating bases in the air gap. The production of the sensing part in a differential form allows to reduce the signal conversion errors of the device.

Generating a signal about the asymmetry of multi-parameter currents, on the basis of the originality of the production of the element in the transformation of three-phase currents into a signal in the form of voltage, the signal transformation capabilities of the converter are expanded, the normalized signal at the output of the device is Loads: 20 V and current voltage and 100 mA. It is possible to process the quantities and parameters of currents using electronic and microprocessor technology.

Controllers are converter-type components that can convert their data into electrical signals for further processing. Converters use the Hall effect to convert input current to output voltage. In the Hall effect, the electrons of the electric current pass through the strength of the magnetic field. The field causes the electrons to "push" to one side of the plate and create a voltage difference

between the two sides. It is the output voltage of the transformer from the side of the plate.

GSM module SIM800L. SIM800L signal transmission device based on GSM module is used in the process of continuous monitoring of the current conditions of power supply sources and voltage parameters of backup energy sources. This module continuously transmits the state after processing each information to the system software. In 95% of cases, this device organizes the reception and sending of data while organizing the process of communication with control systems. With the help of this signal transmission module, most modern systems, i.e. microcontrollers, are remotely controlled. The SIM800L module allows you to create a mobile connection that can be controlled using a microcontroller. The range of functions is very large, for example, it is designed for data transmission in areas not connected to the Wi-Fi network. But SIM800L offers many other functions such as FTP, TCP/IP and HTTP applications, e-mail or MMS. SIM800L is a four-band GSM and GPRS module. It covers GSM850, EGSM900, DCS1800 and PCS1900 frequency bands.

You need a 2G micro-SIM card to use SIM800L. It communicates serially with the microcontroller's SIM800L through RX/TX and AT commands.

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