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6 - 34 Radiation Dose Monitor System and Gate Controller Designed for Personal Safety in HIRFL-CSR

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For personal protection purposes, the slow control group designed a radiation dose monitor system and a gate controller with the radiation protection group in HIRFL-CSR. These two works are listed one by one in this article.

1. The radiation dose monitor system

For radiation protection purposes, the environment radiation dose monitoring is important. According to the characteristics of the detector, self-designed hardware module and switch have been used to build the hardware platform and the whole monitoring system structure is established base on field bus and Ethernet technology. The hardware was specially designed and based on MSP430F169, a mixed signal processor and one of the products from TI. The photo of hardware module used in this system is shown in Fig. 1. The hardware module has been used in RIBLLI and Linac for radiation dose measurement. Fig. 2 shows the GUI interface.

Fig. 1 (color online) Picture of hardware module.

Fig. 2 (color online) Software interface of the monitoring system for Linac.

GUI based on VC++ has been developed to monitor all the equipments. Through this software, accelerator Operators can remotely monitor the radiation dose of neutron and γ-ray detectors.

In aids of this monitoring system, the data real-time monitor of the neutron dose and the γ-ray dose has been realized since Aug. 2016 which shows good security and stability. The next step, we hope to achieve the upgrading of the whole radiation dose monitoring system for radiation protection and personal safety.

2. The gate controller

In order to meet requirements developing and updating continuously for the personal safety interlocking system of IMP, and to establish remote status monitoring for the doors in HIRFL-CSR, a new controller was designed to ensure the reliability and accuracy of condition monitoring for general purpose. The controller called Gate Controller was specially designed and based on MSP430F169[1], a mixed signal processor and one of the products from TI. The structure diagram of the Gate Controller is shown in Fig.3. The main advantages of Gate Controller are as follows[2,3]:

(1) Real-time monitoring of operating status, including door switch status and relay status;

(2) According to the state of the door, a relay is controlled to achieve the operation of the warning light which provides sound and light alarm function;

(3) According to the actual situation, a relay is controlled to interlock the operation of the faraday cylinder to ensure personal safety;

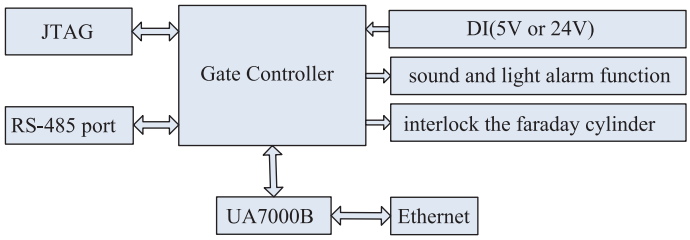

Fig. 3 (color online) Structure of the Gate Controller.

(4) To monitor the logic status of equipments remotely, DI was designed to detect the status of 5 V or 24 V inputs;

(5) The controller is configured with a unique IP address, and the upper layer connects and accesses the controller via IP and port numbers;

(6) RS485 ports were specially designed for serial devices. By appropriate algorithm and the serial interfaces, the controller and equipments could realize the data communication with each other. Meanwhile, all kinds of controllers could cascade with each other used RS485 communication interface.

The controller which has been debugged completely in 2016 is used successfully to complete status monitoring about 10 doors in the regines of ECR and CSRe.

Hardware configuration and software development for the Gate Controller are designed based on IAR and C language. With the corresponding of the software program, the Gate Controller has been working stably and met fully the requirements of the personal safety interlocking system for HIRFL-CSR.

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6 - 35 Design of Digital and Analog Mixed Controller Based on MSP430F149

Ni fafu, Wang Yanyu and Yin Jun

In order to meet the requirements of collection the various types of electronic data which has signals with relatively slowly speed in the site of HIRFL in IMP, a new hardware controller which is combined with digital inputs outputs(DIOs) and analog inputs outputs(AIOs) was designed. Fig. 1 shows the hardware structure.

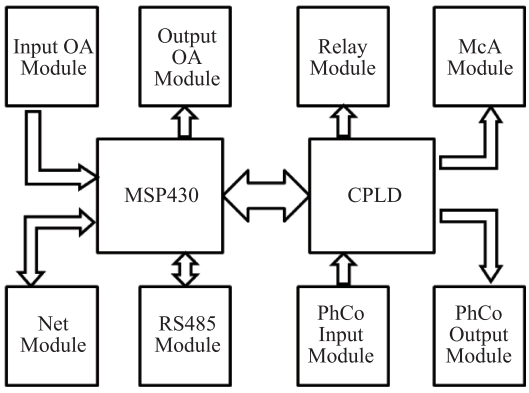

Fig. 1 The structure of controller.

As shown in Fig. 1, the board is consisted of different functional blocks. The AIOs is made up by input or output operational amplifier(OA) modules, because of the analog input or output range of MSP430F149 is from 0 V to +3.3 V[1], inserting the OA module can enlarge the scale of analog input or output up to +10 V. One kind of the DIOs is digital I/O port with Photoelectric Coupler module (PhCo input/output Module) which can get or