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The development of the data processing device for RMS redundancy in KOMAC

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1. Introduction

The radiation monitoring system (RMS), which is part of the radiation safety system of the Proton Accelerator Research Center [1][2], has a redundancy, ranging from data acquisition, data transmission, and the server storage. To consist this redundancy system, the local communication unit to which the detector is connected requires more than one communication port to communicate with each other independent server through two independent communication lines. However, most detector manufacturers provide only one communication port that can be used simultaneously, even though they provide different types of communication specifications. In this paper, we introduce the problems caused by maintaining or broken equipment, and introduce the redundancy device for the data communication applied to solve the single line.

2. Methods and Results

The current RMS consisted of over 100 detectors based on serial communications. These devices are divided into 11 groups depending on their installed regional characteristics and type of detector, and are connected to the data server using 11 serial communication lines. Each serial communication line has another physically independent communication line for redundancy. It consists of two separate communication lines, one detector communicates with two data servers through the two separate communication lines. It has the following limitations in the current system.

1) Must have the same communication protocol (transmission specifications) of detectors in the group
   → Only configurable with detectors from the same manufacturer
2) At least two independent communication ports are required for a transmission unit.
   → Need to develop a parallel-connected communication device (Redundancy device)
3) Different communication command according to each detector manufacturer
   → Need to improve the integrated monitoring program

1) and 2) are hardware limitations that can be only solved by the development of local communication units. That is responsible for each detector and signal processing in the local. We can also solve 3) by developing the integrated monitoring program to support most detector manufacturers' communication methods for the radiation detectors.

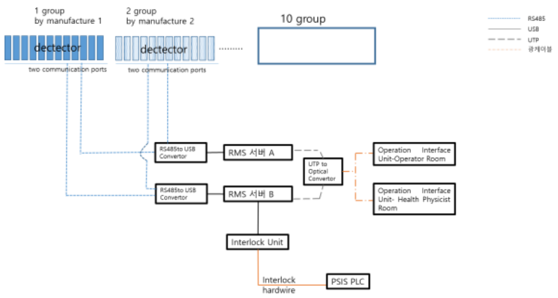

Fig. 1 The diagram of current RMS communication

2.1 Redundancy hardware for the data communication

When new detector replace the existing one, the problem is occurred. Because most detector provide the single data port, it is unavailable to keep the redundancy configuration. The device for redundancy of communication lines directly communicates through the one communication port between a detector and data communication unit installed at the local, and this redundancy device also has two redundancy data ports for communication with two RMS data servers as below the fig. 2.

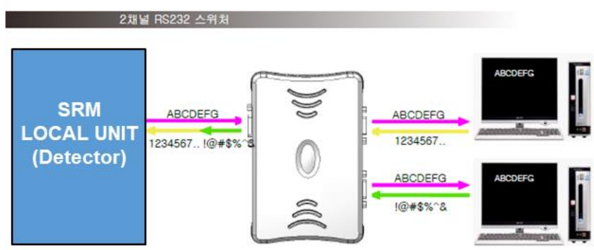

Fig. 2 Communication diagram (redundancy device)

At this time, data corruption can occur because one detector communicates the data (request command and response data) with two data servers in tens of milliseconds. The redundancy device has an internal sequential processing logic module to distinguish between each data server and detector's data to communicate without interference of each data. The sequential processing logic module has a memory which saves the command and response data. So, these data can be sent sequentially between one detector and two data servers.

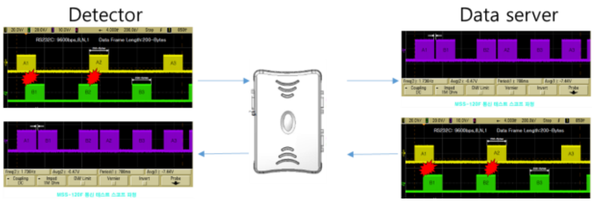

Fig. 3 Data corruption (yellow and green) and the sequential processing data (purple) by the redundancy device

Using this redundancy device, even detectors that support only one communication port at the same time can build two independent networks line and configure full redundancy.

2.2 Software for the data communication

In order to receive the event status, dose rates, and etc. from the detectors, a pre-promised command must be sent to the detector, and the detector that receives the command sends data according to the predetermined structures as a response data. These pre-promised command or response data structures may differ from a detector manufacturer to the others, and even the structures for the same manufacturer may differ from existing ones depending on when the product is released. Most existing pre-promised data structures were built into the integrated monitoring program. And a user will be able to access to the communication data structure through the graphic interfaces in order to modify and add new communication data structure sets. This will enable us to easily modify or add new data structures.

3. Conclusions

For huge nuclear facilities, there are numerous radiation dose monitoring points, and as many radiation instruments are operated. In order to monitor and manage the detectors, it is used to develop the integrated program. On the settled systems, it is difficult to change their configuration, such like a replacement to other devices.

The communication protocols of various companies were reflected in the program at KOMAC. In addition, the program will be improved that users can add or modify communication protocols through a graphic interface, so that we can respond more flexibly to changes in a device configuration. The redundancy device was developed and introduced so that even detector that provides only one communication port can maintain the existing redundant system configuration.

In this paper, we introduced the redundancy device and the integrated program at KOMAC. We can flexibly deal with the change of the unique communication protocol by various manufactures through the graphic user interface, and also communicate redundantly between the local detectors and the RMS data server using the redundancy device.

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