5.2 Development of a beam slit controller by using XPort and Web I/O

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In parallel with the installation of a newly developed remote controllable slit system, a control program has been developed. This program can operate co-currently six slits with two, Manual and Automatic, control modes. Under the Manual mode, the slit can be moved step by step with the click of a computer mouse. On the other hand, once the Automatic mode is selected, the slit can be moved automatically to the preset position. Fig. 1 shows the configuration of the control system. A slit position is read with a Digimatic Indicator ID-C112, Mitsutoyo Co. Japan. The ID-C112 works as a digital dial gauge for the position measurement. The slit position which is digitized by the ID-C112 is transferred to a RS-232C multiplexer and converted to 9600b RS-232C communication signal. The RS-232C multiplexer can throw four digital position signals into one RS-232C signal. Then, this RS-232C signal is transferred to a XPort device in which the RS-232C protocol is converted to 100Mb Ethernet protocol. Finally, a PC gets the information of the slit positions from the XPort through an Ethernet .

A slit motor, US206-401, ORIENTAL MOTOR Co. Japan, is operated with a set of a Web I/O RO-16 device and a relay terminal. The Web I/O is controlled by the PC through the Ethernet and controls the motor rotation through the relay terminal. In order to protect the device from an unexpected discharge, a PhotoMOS relay is used as an output element of the Web I/O. Total response time of the Web I/O and relay terminal is 5 ms and is sufficient for our usage.

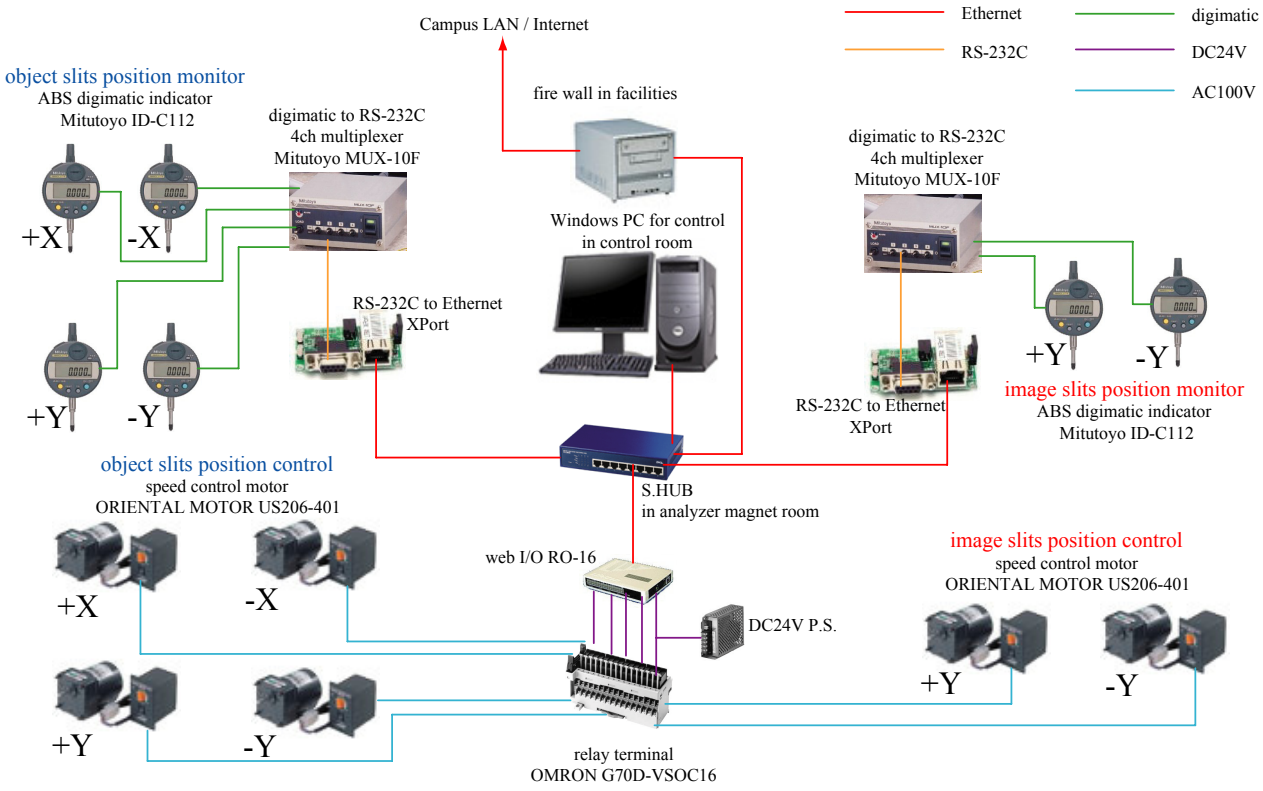

Fig.1. Control system chart.

The opening and closing speed of the slit are 0.008 mm/s and 0.04 mm/s, respectively. An emergency switch is prepared to quit the motor operations quickly when something happened. A control program is written with Visual C++ for Windows by using a multithread programming technique.

Fig. 2 shows a user interface for the slit operation. The interface is divided into two screens. The current positions of the six slits are displayed in a left side screen in Fig.2. On the other hand, the slits are controlled interactively through a right hand screen in Fig.2. The slit can be moved with the IN/OUT button operations on the right hand screen by watching the current slit position on the left hand screen. The slit can be moved also automatically. Following the set of the slit position where you want with a keyboard, the slit can be moved to the specified point by clicking the Automatic button. Six slits can be controlled simultaneously with one operation of the Automatic button. In order to protect from unexpected collision of slit, a software limit switch is installed in the program. Two kinds of programs are developed. One is a suitable for the normal usage. The slit can be moved quickly with the limited, ~10 μm, positioning accuracy. When the accurate positioning is requested, another program is used. The speed is about 10 times lower than that of former one but the positioning accuracy might be better. Fig. 2 and Fig.3 demonstrate the user interface of the high speed and of the high accuracy versions, respectively.

Fig.2. Screen shot about the speed priority

Fig.3. Screen shot about the highly accurate

References

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[2] Y. Yamato, Remote control of beam slits (Example of applying XPort and Web I/O), University of Tsukuba, Technical report No.25(2005) 24-29.