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THE BEAMLINE MOTOR CONTROL SYSTEM OF TAIWAN PHOTON SOURCE

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INTRODUCTION

When using the beamline, in order to be able to ad-just the light source to the required environment of the experiment, the optical system on the beamline is de-signed to be adjustable. The types of mechanisms on the beamline are divided into two categories. The first is the optical path adjustment mechanism used to ad-just the position of the light source; the second is the light path diagnosis mechanism, used to check the condition of the light source when it is in use. Most of the mechanisms are designed with stepper motors. This article explains how the TPS beamline motor control system control various movable mechanisms on the beamline.

SYSTEM ARCHITECTURE

The movable components on the beamline use the eight-axis motor controller as the control core and can be moved after being equipped with a suitable driver, so the user can freely match according to the needs of use, and the controller adopts an independent. In addition, the TPS beamline has improved position accuracy, so all the motor control components on the beamline are equipped with various optical scales to obtain the actual position signal, and the TPS beamline the motor controller of the beamline selection can read the en-coder, allowing the control system to fine-tune the mechanism, so that the position accuracy is improved. (See Fig. 1).

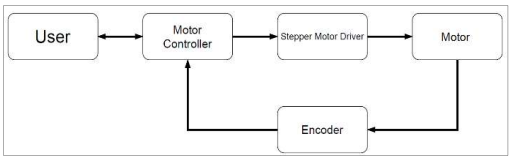

Figure 1: System architecture of Beamline Motor Control System.

HARDWARE DESCRIPTION

The DMC-40x0 motion controller is Galil's highest performance, stand-alone motion controller packaged with optional multi-axis drives in a compact, metal enclosure. The unit operates stand-alone or interfaces to a PC with Ethernet 10/100Base-T or RS232. (See Fig. 2).

Figure 2: The picture of DMC-40x0 motion controller.

CONTROL HARDWARE

TPS motor control system is based on the eight-axis motor controller DMC-4080 manufactured by GALIL, and the peripheral hardware is different due to the experimental characteristics of the beamline, and the stepping motor selected for the optical system will be different, but most of them are divided into Two types, one is a 5-phase stepper motor, the number of divisions is more than 500 (0.72 ˚/Step), and the other is a 2-phase stepper motor, the number of divisions is more than 200 (1.8 ˚/Step), the difference is the smallest part The difference in resolution is set by 5-phase stepper motor 1000 (0.36 ˚/Step) and 2-phase stepper motor 400 (0.9 ˚/Step) in TPS. As for the actual resolution, it is set by stepping motor. The ratio between the motor and the mechanical structure is determined.

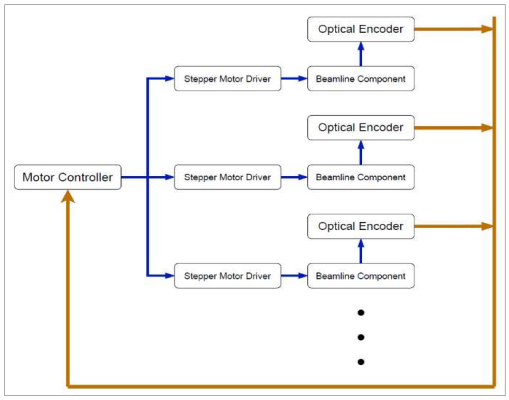

Figure 3: System architecture of Hardware.

In addition, many mirror chamber in the TPS beamline are equipped with vacuum motors to move the platform in the vacuum, but the vacuum cannot rely on convection to dissipate heat, and can only be carried out by conduction, but in order to protect the motor in the vacuum Overheating will cause damage, so a temperature controller is installed to monitor the motor in the vacuum. When the temperature is too high, the motor driver will be turned off, interrupting the current to the motor, and when the temperature is low, it will start, so that the vacuum can be extended. The life of the motor. (See Fig. 4 and 5).

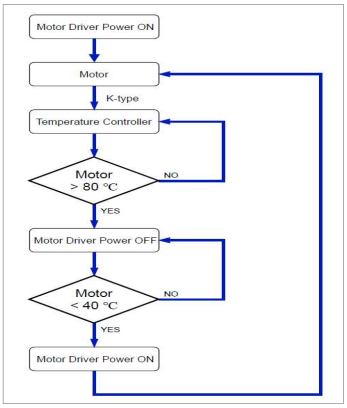

Figure 4: The temperature protection flow chart of the vacuum motor.

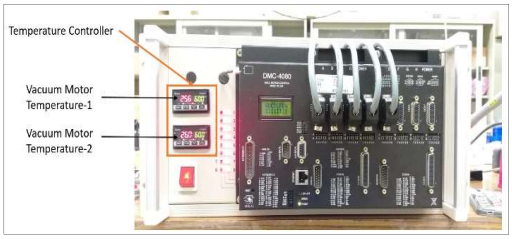

Figure 5: Temperature Controller & Motor Controller.

APPLICATION

At present, most of the beamline control systems that have been completed in TPS are built with GALIL controller as the core. Although the mechanical structure of the following purchased equipment is designed and manufactured by an external manufacturer, the motor control system that can be executed is designed and manufactured in the NSRRC, such as various optical mirror chamber on the TPS beamline(TPS 21A 4BCM, TPS 23A HDCM, TPS 09A End-Station, TPS 44A CM…).

CONCLUSION

The motor control system on the TPS beamline is de-signed and manufactured internally by NSRRC. There-fore, the mastery of the technology is quite mature. When an abnormality or malfunction occurs in the system, it can be quickly eliminated, which greatly improves the efficiency of use.

ACKNOWLEDGEMENT

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