beam intensity is 90 μA. In practice, the proposed control software ensures safe and stable operation. Under the support of the control software, the electronic cooler has successfully cooled theion beam according to expectations. The experimental results show that the operation and control of high-voltage power supplies are also stable. The proposed electronic cooler control software meets the requirements of the control functions and makes experimental operations more automatic and visual. The software has been running successfully for several months, and the desired advantages of precision, efficiency, stability, and convenient operation have been shown in experiments.

6 - 32 Realization of Limit Position Protection Function Using PLC Program in Motion Control Area

Zhang Jianchuan, Zhou Detai and Wang Yanyu

In motion control area, safety consideration while the moving part touches the limit switch is very important. Otherwise there might be device damage if the moving parts still move toward the limit switch after it touches the switch. In the SFC extraction electrostatic spectrum motion control project[1] and the Xi'an 200 MeV proton device electrostatic spectrum motion control work, we realized the limit position protection function using Phoenix PLC and Rockwell Allen Bradley (AB) PLC. In the Phoenix PLC, a function block is designed using ST language. In the AB PLC, ladder logic programming language is used to realize the function.

Basically, two actions are executed as soon as the moving part "touches" the limit switch: the moving part stops emergently and the moving direction will be auto set to a "safe" one. The moving direction auto set function means that if the moving part touches the "left" limit, the moving direction will be set to "right" automatically. In this case, even if an error command "moving left" is send to the controller, the moving part will still move right.

Fig. 1 shows the ladder logic of the emergency stop function in RSLogix500 platform. Fig. 2 shows the function block of the moving direction auto set module in Phoenix PC WORX platform.

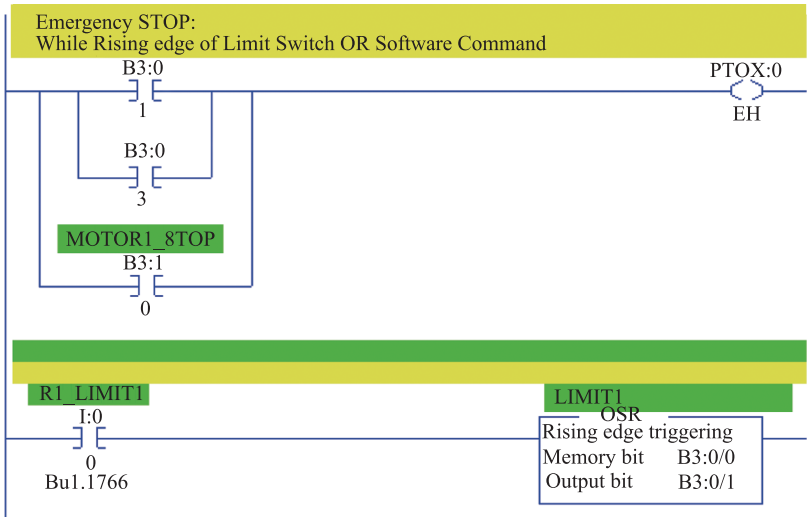

Fig. 1 (color online) Emergent stop function in RSLogix500 platform.

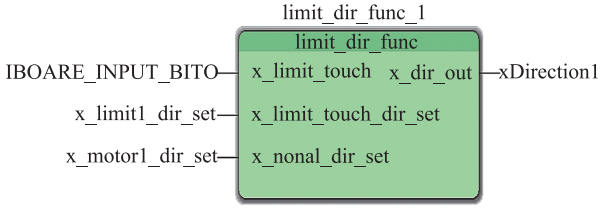

Fig. 2 (color online) Direction auto set module in PC WORX platform.

These protection functions were tested and proved to be working well. In the future, we will try to use this method in other application areas and maybe find other good ways to achieve better protection functions.

Reference

[1] Jianchuan Zhang, Xiaoying Zhang, Detai Zhou, et al., Nucl. Phys. Rev., 33(2016)41.