SLC500 Programmerable Logic Controller Hot Standby Two-node Cluster

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Abstract: This paper describe the hardware configuration and communication test of SLC500 Programmerable Logic Controller Hot Standby Two-node Cluster

Keywords: SLC500, Hot Standby Two-node Cluster

1 INTRODUCTION

With the development of modern network technology and automation level of factory, the requirements of communication ability and stability of basic control unit PLC were increased to adapt for the combination of control and information management function. The communication between PLC and computers can utilize the stability and flexibility of PLC sufficiently and the computer's advantages on management and monitoring. Meanwhile, the control system's stability can be improved by Hot Standby Two-node Cluster. SLC500 Series of Programmerable Logic Controller produced by Rockwell is a popular used industrial control product, which is small in profile, powerful in function and flexible in configuration. That can constitute an economical Hot Standby Two-node Cluster to improve the stability of control system.

2 HARDWARE CONFIGURATION

Hot Standby Two-node Cluster is required for improving the system stability. Two PLC setups work synchronously. One is master, which control the system operation, and the other is backup, which is used for monitering. If the master is broken down, the backup will turn to be master to control the system. Fig.1 describe the profile of control system of ESP in power station. Two industrial personal computers (IPCs) are connected with PLC respectively through ethernet and remote I/O. In this control system, SLC500 is used in PLC, which is composed by double CPUs and double hot standby modulars. Remote I/O (RIO) fieldbus will be connected to SLC system through the matching of scanner modular and adapter modular. This constructure of system not only take advantages of the good stability and anti-interference ability of PLC, but also the abundant softwares, good displaying and convenient input of IPC. Meanwhile, the system can be expanded easily. Two IPCs have the same hardware configuration. They are used as upper computer to accomplish two missions. First, IPC offers man-machine interface, which is convenient for the operator to monitor and control the system. Second, IPC communicates with PLC, collects its state information for monitoring and transfer the command from the operator for controlling. Two IPCs work together and connected by ethernet. One is for engineers and the other is for operators. Commands from the two IPCs have the same feedback. When both of them have problems, control system can still work under the primary commands. That is one of the reasons why the stability and flexibility of system can be improved. Control program is loaded on two PLCs. Both of them have the same hardware configuration except for IP address. The mainframe of PLC communicate with remote frame through RIO to receive information from input modular, and export information to output modular through executive program. Meanwhile, the CPU modular of PLC also has a mission of exchanging information with the IPC. Two CPU modulars are used to realize Hot Standby Two-node Cluster. Two PLCs communicate with each other through HSSL, and work synchronously and monitor mutually. One is master, which control the system operation, and the other is backup, which is used for monitoring. If the master is broken down, the backup will turn to be master to control the system.

3 SYSTEM COMMUNICATION

Two IPCs are connected by LAN swtich, and so was the connection between IPC and PLC. The protocol of ethernet is TCP/IP. Each IPC and PLC is an independent node and has its own IP address. The communication between IPC and PLC is used for monitoring the state of system and sending controlling command. The monitoring software loaded on IPC is written with RSView32, and runs under the "Runtime" of RSView32. A communication software called RSLinx is used for exchanging data between IPC and PLC. RSView32 can label each PLC's program home address and display on the screen of IPC directly. Remote I/O communication: Remote I/O network is used for the communication between CPU modular and I/O modular. I/O address in I/O frame will be mapped on the image list of CPU. Then controlling process can be realized.

4 SYSTEM DEBUGGING

System debugging process can be divided into two phases: setting hardware switch and writing hot standby program.

In the first phase, I/O addressing mode and communication speed are decided according to hardware configuration of system. Based on that, the setup switches of scanner modular and adapter modular will be set (shown in Fig. 2).

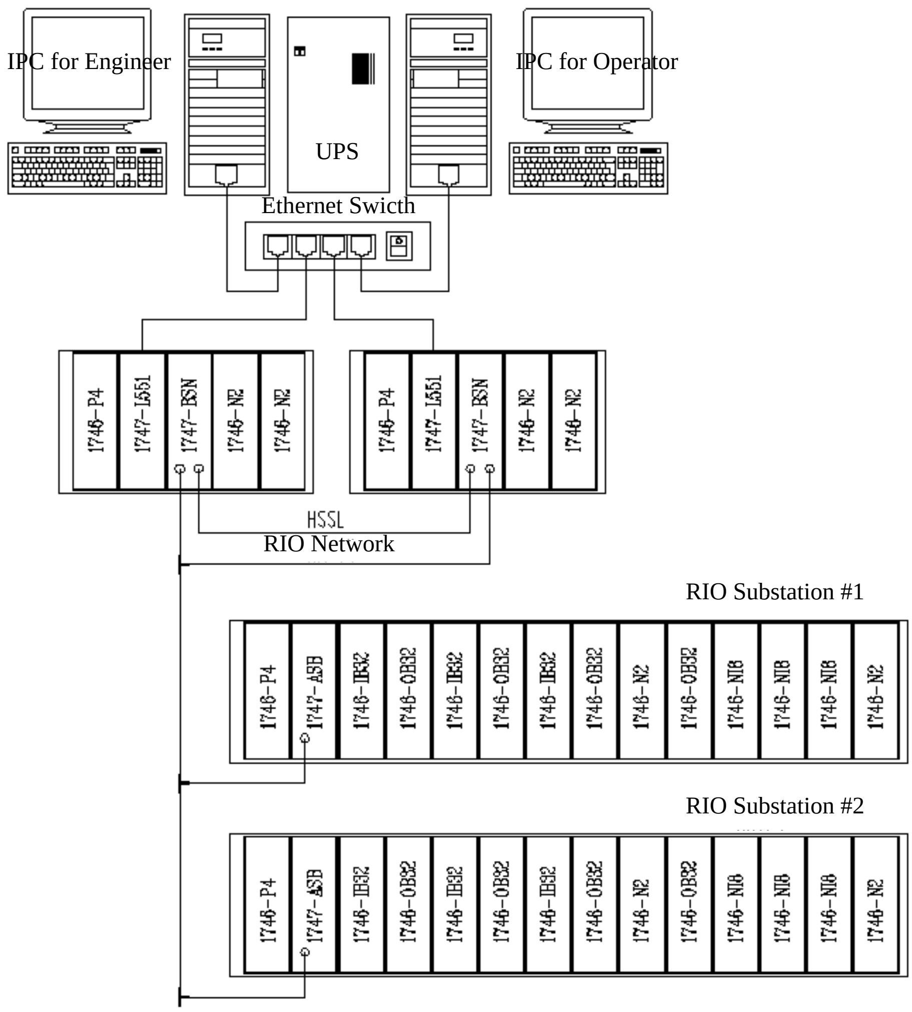

Fig. 1 Hardware Configuration of System

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In the second phase, RSLogix 500 will be used to write program in ladder chart language. A piece of judge instruction and data move instruction should be included in the program. They transfer the content in master’s CPU to backup’s CPU to judge the former’s state. If something wrong is discovered, the backup will turn to be the master, and send alarm information to IPC.

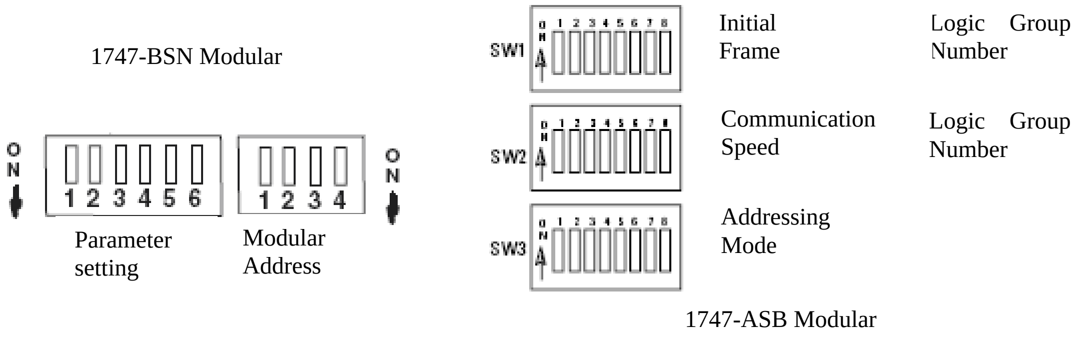

Fig. 2 Hardware Switch Setting

7 CONCLUSSIONS

This system configuration is high-end in the series of SLC500, but the cost of modular is about 40%-60% lower than popular used hot standby two-node cluster PLC series at present (Quantum of?, Controllogix of AB, S7-400 series of Siemens), and the communication ability and expansion capacity are also no less excellent. If there is no special requirement in an actual system configuration, above 5/02 modulars can be chosen to decrease the cost further. So it is a very suitable solution for the customers who will consider the problems of both stability and economic.