A Computer Room Security Monitoring System Based on Siemens PLC

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ABSTRACT: *With the development of the times, people are increasingly pursuing comfort in their daily lives, leading to the emergence of various equipment systems to improve people's accommodation. But these instruments and equipment need to be purchased at a high price, so a safe place to store them is needed, and computer rooms have emerged. A computer room environment monitoring system based on programmable controllers (PLCs) uses sensors to detect the environment of the computer room and transmit information to the PLC through corresponding communication methods. The PLC processes the data and uses an alarm module to alarm, enabling workers to promptly learn about the problems and situations in the computer room, and to solve the problems as soon as they occur, Preventing problems in the computer room that affect people's normal life and travel. So it is necessary to monitor and manage the temperature, humidity, smoke, and power supply of the computer room. With the development of computer technology and equipment management technology, it is necessary to design a safer and more reliable system to achieve remote unmanned management of the computer room.*

In this design, a hardware schematic diagram was drawn and the program for the computer room monitoring system was written. According to its different functions, it is divided into four parts: information collection, information transmission, information processing, and interface monitoring. The paper mainly describes the development background and functional requirements of the computer room monitoring system, and analyzes in detail the software and hardware issues and interface monitoring of the computer room monitoring system.
***Key words:** Programmable logic controller (PLC), computer room monitoring, Internet of things*

Ⅰ. INTRODUCTION

With the development of The Times, people increasingly pursue the comfort of life, so there are various equipment systems to improve people's accommodation life. However, these instruments and equipment are expensive to buy, so a safe place to store these instruments is needed, and the machine room came into being. Later, the computer room became a large information storage center and management center. Based on programmable controller (PLC) in the computer room environment monitoring system, which USES the programmable controller (PLC) to test the machine room environment and feedback, make the staff can know the question and the situation room in time, can be in the problem in the first place will solve problems, and prevent the room to the problem of the expanded, influence people's normal life and travel. And the data center infrastructure construction, a very important link is the construction of the computer room. The equipment room engineering is not only a construction, electrical, and network integrated construction, but also requires rich experience in engineering implementation and equipment management. To ensure the normal operation of devices in the equipment room, you need to maintain and manage the power environment in the equipment room, such as the power supply, temperature, and humidity. With the development of computer technology and equipment management technology, a more secure and reliable system is needed for remote monitoring of the environment of the computer room, so that the remote unmanned management of the computer room can be realized.

This paper mainly focuses on data acquisition and data analysis control of computer room monitoring system. During data collection, various sensors are used to collect and transmit data, including temperature and humidity sensors and smoke sensors. The T/H sensor detects the temperature and humidity in the equipment room. If the temperature and humidity of the device are not appropriate, the service life of the device may be affected or the device may be damaged. The smoke sensor is composed of photosensitive element, conversion element and auxiliary element. When the smoke enters the inside of the instrument, the light will appear astigmatism under the influence of smoke molecules. With the increase of smoke, the photosensitive element will sense the existence of light, and the conversion element inside the sensor can convert the light signal into electrical signal. When the smoke concentration reaches a certain level, the smoke sensor will send out a signal to alarm. In the event of a fire, a signal will be transmitted to the fire control center, triggering the fire alarm, at this time the sprinkler system's nozzle is broken, the release of fire extinguishing material, the fire will be extinguished. In the process

of equipment working, the power quality of power supply is reduced, which will lead to the fluctuation of current or voltage and lead to data recording problems, and even affect the stored information. UPS, also known as uninterruptible power supply, can provide an uninterrupted and stable power supply for some equipment to use, and the uninterruptible power supply can ensure that the instrument is continuously charged within 24 days. Because there are batteries in the uninterruptible power supply, the instrument can be energized in the event of a power failure. The uninterruptible power supply can also be self-monitored, and when the problem is detected, the alarm signal is transmitted to the controller. Uninterruptible power supply When connected, two uninterruptible power supplies can be used to form a secondary load in the equipment room, which makes the equipment room more secure and reliable.

The controller used is the programmable controller, a small controller of Siemens. The controller has a wide range of applications and is easily affordable. The controller can also hold a considerable amount of data. In the computer room monitoring system design, the alarm part is also very important. When the system has problems, it is necessary to alarm to inform the staff to repair and maintain the system, and the alarm system can also be SMS to remind the staff, reduce the machine room monitoring manual help, reduce the risk caused by manual negligence. In the communication between hardware, the network of 485 network port is used to realize data transmission. Ethernet switches can be used to transfer data.

In this design draws out the hardware schematic diagram, has written the computer room monitoring system program. According to its different functions, it is divided into four parts: information collection part, information transmission part, information processing part and interface monitoring part. The paper mainly writes the background of the computer room monitoring system and the development of the computer room monitoring system, and analyzes in detail the various parts of the computer room monitoring system hardware selection problems, software programming problems and interface monitoring.

Ⅱ. OVERALLDESIGN OF COMPUTER ROOM MONITORING SYSTEM

This chapter mainly discusses the overall scheme design of the computer room security monitoring system based on Siemens PLC. In order to achieve the functionality of the computer room monitoring system, we need to first analyze the functions that the computer room monitoring system needs to achieve and our requirements.

Analysis of the Overall Structure of the Computer Room Monitoring System

The computer room monitoring system designed in this project is mainly divided into data collection, data processing, and equipment parts. In environmental data collection, various sensors are mainly used to collect environmental data, and the collected data is transmitted to Siemens PLC, which processes and stores the data. Finally, the data will be displayed on the display screen.

Use sensors to collect environmental data in data collection. For example, temperature and humidity sensors can monitor the temperature and humidity in the computer room and transmit the monitored data to the PLC. The smoke sensor can sense the concentration of smoke in the environment to determine whether a fire has occurred in the computer room and give an alarm.

Data processing is the use of PLC to process the collected data and proceed with the next control process. The data is transmitted to the programmable controller through the RS485 communication port, and the programmable controller already has corresponding software programs. The programmable controller will follow the software program to achieve the desired functionality and results.

The equipment section includes data display and instrument section. After being processed by the PLC, the data is displayed in real-time on the display screen, and we can keep track of various data situations at any time. In order to ensure that the computer room environment is suitable for the normal operation of instruments and equipment, instruments such as air conditioners need to be installed in the computer room to ensure that the temperature, humidity, and other conditions in the computer room are in the most suitable state. Because various instruments and equipment can only play their maximum role in the most suitable temperature environment, reach the maximum service life, and will not cause damage to all instruments and equipment.

Functional Analysis of Computer Room Monitoring System

There are many instruments and equipment placed in the computer room, which not only have many control systems but also contain a large amount of data. Because the environment and power system in the computer room have a certain impact on the operation of instruments, we have many requirements in computer room monitoring. We hope that the equipment in the computer room can operate to the maximum extent in a suitable environment.

In computer room monitoring, we need to monitor the temperature, humidity, smoke, and power supply system in the computer room. Because these factors have an impact on the normal operation of instruments in the computer room.

The operation of various equipment in the computer room has certain temperature and humidity requirements. When the temperature in the computer room exceeds 30 ℃ or 40 ℃, it can easily cause errors in the data recorded in the computer room. In severe cases, it can reduce the lifespan of the battery and equipment in the computer room, and in the most serious case, it can cause a short circuit in the power supply of the computer room, causing a fire and threatening people's safety. Low temperature can also cause problems with the equipment in the computer room and prevent it from functioning properly.

Power quality mainly refers to voltage quality, current quality, power supply quality, and electricity consumption quality. When supplying power to buildings, it is necessary to ensure the quality of electrical energy, as deviations in the current, voltage, and frequency of the power supply can affect the instruments in the building to a certain extent. When the power supply voltage changes too much, the operation of machinery and equipment will also undergo certain changes. Severe voltage deviations can cause equipment and circuits to burn down, and even lead to fires, posing a threat to people's personal safety. Nowadays, with the development of the information age, The impact on electronic computers and precision instruments, which have stricter requirements for power quality during use, can lead to errors in the calculated data in case of power accidents, and in severe cases, damage to existing information. According to data statistics, the main cause of death in fires is not burns, but death caused by inhaling excessive toxic and harmful substances. Due to the use of a large amount of compounds during construction, these compounds can generate toxic and harmful substances during combustion. Therefore, smoke monitoring and management are also necessary in computer room monitoring.

In summary, in the design of computer room monitoring, it is necessary to monitor the environment inside the computer room and the power system, which can reduce damage to instruments and avoid the occurrence of some problems.

There are always various problems in computer room monitoring due to various reasons, and when such problems occur, some will be resolved with the help of other instruments, while others require human assistance. In computer room monitoring, environmental issues can be directly turned on by the machine with the help of the program. But when there is a problem with the machine, it is necessary to alarm and notify management personnel to solve the problem. Therefore, giving an alarm after a problem occurs is also a crucial part of the computer room monitoring system.

In order to ensure the normal operation of the computer room monitoring system, it is necessary to maintain and maintain the system on a monthly basis. The interface display allows for quick access to the environmental conditions of the computer room and timely handling of potential crisis situations.

Functional Design of Computer Room Monitoring System

Through the analysis of the requirements for the computer room monitoring system, we have gained a certain understanding of the functions that need to be implemented in the computer room, and have summarized these functions in the following points. As shown in Fig. 1.
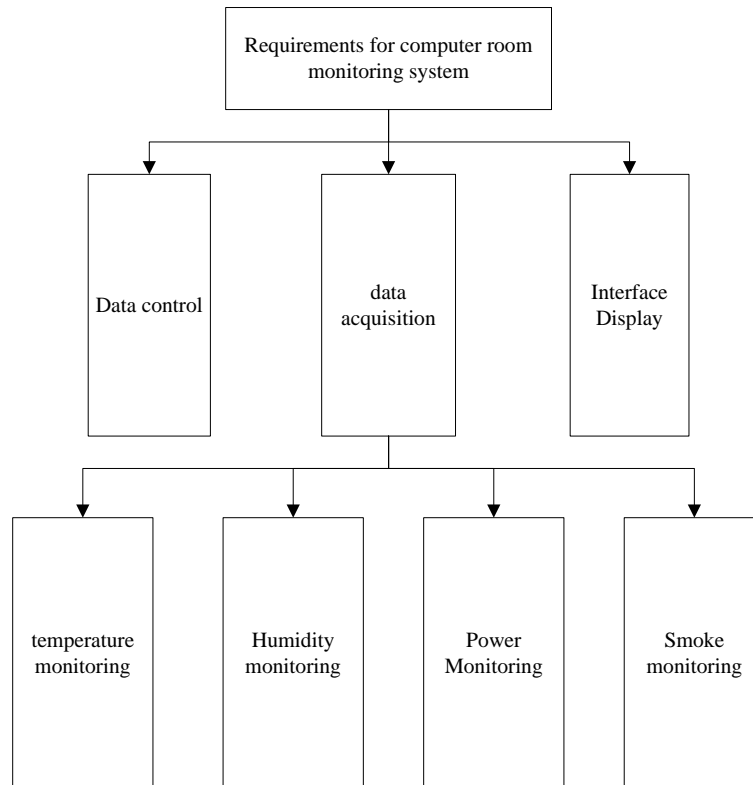
Fig. 1 Monitoring System Requirements Analysis Diagram

In the design of the computer room requirements mentioned above, some functional requirements have been listed. These requirements can meet the functional requirements of the computer room monitoring system mentioned above. Its functions include data control, data collection, and interface display.

1) data acquisition

Data collection refers to the collection of environmental data within the computer room. Environmental data includes temperature data, humidity data, and smoke data. Other data collection methods include uninterrupted power supply data, which together form the secretary collection part of the computer room monitoring system. Data collection is mainly aimed at the current situation of the computer room, which can be transmitted in real-time to the programmable controller, enabling the programmable controller to accurately and quickly judge the current situation, and keeping the instruments in the computer room in normal operation.

2) Over limit alarm:

The environment and power supply of the computer room are not always unchanged, but some situations can be directly handled by programmable controllers controlling instruments. But there are still some situations where programmable controllers cannot solve them. At this point, an alarm needs to be sent to notify the staff to resolve the situation in the computer room. And the most important requirement for the computer room monitoring system is the data collection interface, which displays data control, temperature monitoring, humidity monitoring, power supply monitoring, smoke monitoring.

3) Interface Display:

In computer rooms, staff inspect instruments every month or quarter to eliminate potential dangers and hazards, so the interface display is particularly important at this time. Because the interface can display the situation of various parts, it can quickly determine whether the data is normal and correct during inspection.

In a computer room, the functional design of the monitoring system is based on people's needs for the functionality of the room. The main requirement of this design is to monitor the temperature, humidity, power supply, and smoke in the computer room. In the design, a programmable controller was used as the central part of the control, and then electrical appliances such as air conditioning were added to ensure that various instruments and equipment in the computer room can operate in their most suitable conditions, with minimal damage to the instruments in the computer room when operating in a suitable environment. For emergency situations, the alarm module can send text messages to notify the staff for handling.

Overall Design of Computer Room Monitoring System

The computer room houses the controllers of communication, fire protection, monitoring and other systems in the building, as well as preserves some important information and data. When an accident occurs in the computer room, the entire building will be in an extremely unsafe state, which may result in significant property damage. Therefore, the monitoring system in the computer room plays an important role in preventing danger.

For example, teaching buildings and dormitory buildings in schools generally have a three-level load. Therefore, most of these types of buildings only have one line of mains power connected to the distribution box. If there is a power outage problem in the building, electricians need to repair the power outage situation, and only after the repair can electricity be restored. Therefore, uninterrupted power supply is needed in the computer room to address this issue. Only after the power problem is resolved can the problems in the computer room be promptly fed back and resolved. Therefore, in order to ensure the quality of electrical energy, uninterrupted power supply has been added. Uninterruptible power supply can ensure the power consumption of electrical appliances during a power outage. There is a battery inside the uninterruptible power supply that can maintain power for several hours after a power outage, and there is a control unit inside. After a few seconds of a power outage, the power consumption of the equipment can be restored. So, uninterruptible power supply can appear as a backup power supply. Of course, some instruments have strict requirements for power quality. In this case, the UPS can be connected to the circuit to ensure the stability of current and voltage.

The monitoring of the computer room includes temperature, humidity, and smoke. In the north, the weather is hot in summer, cold in winter, brief in spring and autumn, and prone to rain and humidity. However, most of the instruments in the computer room were purchased at a high price and a large amount of human resources were used for installation. The temperature in the computer room is generally controlled between 20 ℃ and 26 ℃, and should not be too high or too low. The humidity in the computer room is generally maintained between 45% RH and 65% RH, as the instruments are made of metal and may undergo oxidation reactions with water and oxygen in humid environments, causing corrosion to the metals.

At the same time, it is even more important to provide warnings for fires. Due to the use of many combustible materials during the construction of buildings, high temperatures will be generated after a fire occurs, and a large amount of toxic and harmful gases will be generated after combustion. Therefore, it is advisable to nip the fire in the cradle at the beginning of the fire. So a photoelectric smoke alarm has been placed in the computer room to detect early fires.

Selection of Communication Methods in Computer Room Monitoring System

The current communication technologies include short range wireless technology such as Bluetooth, Wi Fi, ZigBee, 4G, WiMAX, Ethernet based wired technology such as fiber optic and network cable communication, as well as quantum communication technology with special needs. And we mainly use wired communication technology in the computer room monitoring system, which uses twisted pair cables for connection.

Some sensors can be directly connected to the PLC, while other devices need to be connected to the hub and then connected to the PLC through the RS485 port.

In the computer room monitoring system, twisted pair cables are used to connect various instruments and 485 networking is used for communication. The data will be transmitted through the network cable.

Ⅲ. DETALID HARDWARE DESIGN OF COMPUTER ROOM MONITORING SYSTEM

In Chapter 2, we designed the overall scheme of the monitoring system design, and we can understand the issues we need to pay attention to in the design of the computer room monitoring system, as well as the functions we need to achieve in the design. Through the analysis of the computer room monitoring system, we can divide the monitoring system into front-end sensor parts, controller parts, and other auxiliary parts based on hardware. In this chapter, it is necessary to search for the models of various instruments and then choose the communication method for connection.

Overall Hardware Analysis

The hardware selection mainly includes temperature and humidity sensors for data collection, smoke sensors, and uninterruptible power supplies. The programmable controller uses Siemens S7-200 series products, which can effectively accommodate the system. There is also an alarm module in the hardware that issues physical quantities such as temperature and humidity. Due to the limited number of RS485 ports on the PLC, a hub was used. There are also some devices that play an auxiliary role in the design.

Computer Room Monitoring Data Collection Hardware

The data collection hardware for computer room monitoring includes temperature and humidity sensors, smoke sensors, and uninterruptible power supplies. Temperature and humidity sensors measure two physical

quantities, temperature and humidity, and can transmit the values in the environment to the sensor and controlled device controller upper computer data communication equipment smoke sensor temperature and humidity sensor UPSGRM200 air conditioning humidifier dehumidifier hub Ximenzi S7-200CPU226H and EM235 module PC.

1) Temperature and Humidity Sensor

In this graduation project, the model of the temperature and humidity sensor is JXBS-3001-TH-S75. The power supply is 12-24VDC. Reference value at a temperature of 23 ± 3 ℃ and 40 ± 10% rh. Input power supply inside the sensor.

This type of temperature and humidity sensor has many advantages, such as high sensitivity and accurate data when used. This temperature and humidity sensor is a wall mounted type, so the sensor can be directly mounted on the wall in the computer room, and the sensor can monitor the temperature and humidity inside the computer room on its own. Due to the fact that the temperature and humidity in the temperature and humidity sensors are analog quantities, it is necessary to add an EM235 module to the PLC. The temperature and humidity sensor outputs voltage type data, which can be directly connected to the analog module.

A minimum of 2 temperature and humidity sensors need to be installed indoors within a range of 300 square meters or less. Due to the large area of the computer room, the data collected by a temperature and humidity sensor may not be very accurate.

2) Smoke Sensor

The smoke sensor has chosen the RS485 photoelectric smoke sensor, which is the HB150 model. The use of photoelectric smoke sensors can be used to monitor smoke sensing ions in the computer room. When smoke is generated, it becomes light, so the smoke will move upwards. The principle of a smoke sensor is that there is a photosensitive element inside the smoke sensor, and under normal circumstances, no light will be captured by the photosensitive element. And when there is smoke in the computer room, the mass of smoke particles is light, so they will rise. After reaching the ceiling, entering the interior of the smoke sensor, the light is disturbed by smoke particles and will scatter, causing the photosensitive element to sense the light. The more smoke particles there are, the more light the photosensitive element captures. When the light captured by the photosensitive element reaches a certain level, the photoelectric conversion element inside the sensor will convert the sensed light signal into an electrical signal. Afterwards, the signal will be transmitted through the line to the automatic fire alarm system, causing the nozzle of the sprinkler system to rupture and extinguishing the flames. At the same time, the signal will also be transmitted to the alarm system to alert the staff of a fire. The smoke sensor of this model is a switch type sensor. The smoke alarm is installed on the ceiling and connected to a programmable controller. When the smoke concentration in the computer room reaches a certain level, the smoke sensor detects the smoke signal. The programmable controller will process the received signal and then give an alarm to notify the staff to handle it.

Installation requirements for smoke sensors: Install one smoke sensor every 25 square meters to 40 square meters in the room. Install a smoke sensor within 0.5 square meters to 2.5 square meters above particularly important equipment. To ensure the normal operation of the smoke sensor, it is necessary to clean the sensor every 6 months. It should be noted that the power should be turned off during cleaning.
The smoke sensor is a switch signal, so it can be directly connected to the PLC.

3) UPS

Uninterruptible Power Supply, also known as UPS (Uninterruptible Power Supply), refers to an energy storage device that can provide stable and uninterrupted power supply to the computer room for 24 hours, mainly for instruments and equipment that require stable power supply to operate normally. When the mains power supply is connected to an uninterruptible power supply, the uninterruptible power supply is equivalent to a voltage stabilizing device, providing stable power to the instrument equipment; When a power outage occurs, the uninterruptible power supply is equivalent to a backup power supply, which can instantly restore power to the instrument equipment, enabling the equipment to operate normally and protecting the software and hardware parts of the equipment from damage.

The uninterruptible power supply consists of a battery and a host. The battery can store electrical energy when connected to the mains, and use the energy from the battery to power the equipment during power outages. Generally speaking, an uninterruptible power supply can restore the power consumption of equipment immediately after a power outage, and can provide power supply for 2 to 3 hours. When using an uninterruptible power supply, it is possible to directly connect the uninterruptible power supply to the mains and connect other devices to the uninterruptible power supply. To ensure the safety of the computer room, it is possible to convert the power supply of the computer room into two power sources and connect them to the equipment. In order to ensure continuous and uninterrupted operation of the equipment, it is also possible to reserve several uninterruptible power supplies and use one for use and one for backup to increase the stability of the power supply.

When the UPS fails, the system will directly connect the mains power to the system, which will not affect the maintenance of the UPS.

The model used for the uninterruptible power supply is UPS2000-A-6KTL-S. This model has a communication interface at the back of the uninterruptible power supply, which is RS-485. Because the uninterruptible power supply itself is controlled by a host, it can measure the current working state on its own. Through a network cable, the uninterruptible power supply can be connected to a programmable controller, and its signal is collected by the PLC, which is then displayed in real-time on the display screen interface.

Selection of Programmable Controllers

Due to the need to consider redundancy issues and the number of various sensors in this design, a large capacity programmable controller is required to ensure that all inputs and outputs are included. The programmable controller used is CPU226 from Siemens S7-200 series. CPU226 has 24 inputs and 16 outputs, and the power supply voltage is 24V DC power supply. There are two RS485 interfaces that can achieve wired network wiring communication. Due to the fact that the temperature and humidity sensors are analog data, Siemens PLC needs to add an analog module - EM235 module.

Selection of auxiliary equipment

Other auxiliary hardware devices include air conditioners, dehumidifiers, wet film humidifiers, hubs, and alarm modules. The first three are to ensure that the computer room environment remains in a suitable state. The hub is a kind of basic hardware, which is used to Regenerative amplification the received signal. The alarm module can transmit alarm information to mobile phones, enabling staff to promptly know that there is a problem in the computer room.

1) Air-conditioning

The air conditioner used in the computer room is a dedicated air conditioner for the computer room, with a model of HF-64LW/T16SD. Its standard configuration is R410A refrigerant, with a significant increase in efficiency. Safe and reliable, it can operate continuously throughout the day, and can also achieve automatic alarm and self diagnosis. It also supports RS485 communication mode, and its functional forms can be selected as single cooling type, cold and warm type with electric heating and constant temperature and humidity operation.

A 485 bus with powerful group control function and highly reliable conflict detection method. Capable of group control of 16 units, supporting rotation backup and cascading functions to avoid competitive operation. The air conditioner also has a controller and display, which can achieve group control of 16 units and meet backup polling. The cascade automatic switching function has host group control function. The display screen adopts a liquid crystal display screen, which is convenient for system expansion. It can accommodate n machines on one platform, and multiple machine contents can be viewed and controlled on a single screen. Suitable for small and medium-sized switch rooms, high-tech environments, and practical applications.

2) Humidifier

The SHC-200 constant humidity machine room controls a humidity range of 40% RH to 70% RH, which meets the requirements for humidity in the machine room in this graduation design. The power supply voltage used is 380V. Equipped with standard Modbus communication protocol and RS485 remote monitoring port. The large capacity built-in water tank makes it easy to use. The method of humidification is to use wet film vaporization humidification, which can cool the computer room by 3-5 degrees Celsius and reduce the refrigeration energy consumption of the air conditioning. The materials humidified in the humidifier have flame retardant, self igniting properties, and a fire resistance rating of B1. Its absorption rate is greater than 250%, saturation rate is greater than 90%, and its service life is more than 8 years.

3) Dehumidifier

The equipment model of the dehumidifier is CF6.8D, with a dehumidification capacity of 6.8kg/h and humidity adjustment of 10% RH~98% RH. It has an RS485 interface and adopts Modbus communication protocol, which can achieve remote switch control, humidity setting, and actual operation status detection of the dehumidifier.

Precautions for industrial dehumidifiers: The dehumidifier should be placed in the central position indoors to achieve uniform dehumidification. When using a dehumidifier, the doors and windows should be closed to achieve good dehumidification effect. When using a dehumidifier, it should be placed on a flat surface to avoid machine malfunction. The filter screen of the dehumidifier should be regularly cleaned and replaced to ensure dehumidification performance. When not using the dehumidifier for a long time, the power plug should be unplugged.

4) Alarm Module

The alarm module has selected the GRM200 series module. GRM200 industrial grade intelligent controller is an embedded remote alarm and monitoring terminal developed by Jucheng Technology. GRM200 is designed for industrial monitoring sites that require unmanned and remote control requirements. It can achieve functions such as PLC SMS or GPRS remote alarm, remote control, and remote query, and is applied in fields such as computer room alarm, base station monitoring, industrial automation control, environmental monitoring, and water supply.

GRM200 application scope: PLC remote computer configuration software monitoring, mobile SMS alarm, SMS control, SMS query, mobile webpage monitoring. Configuration software and touch screen SMS alarm, SMS control, SMS query. Used separately for a small programmable controller (PLC) with SMS function, achieving both control logic and alarm functions. It can be used for wireless monitoring of temperature, humidity, smoke, and SMS alarms in the computer room.

5) Hub

The hub adopts a 16 channel RS485 isolation hub, which has 4 completely electrically isolated RS485 channels, each with an independent transceiver, achieving multi-point connection in the complex structure of the bus, allowing users to flexibly wiring.

After one port of the 16 channel RS485 isolation hub is damaged, the other ports will not be affected. So hubs can reduce the difficulty of networking engineering, improve efficiency, and increase the security of networking.

6) Upper computer

The upper computer is a computer that can directly issue operating commands, usually a PC. The lower computer is usually a controller controlled by the model, and the lower computer designed in this design is a Siemens 200 PLC. The upper computer can monitor and control the system, and the data information of each node in the system can be seen on the upper computer.

IV. DESIGN OF CONTRAL UNIT FOR COMPUTER ROOM MONITORING SYSTEM

The communication method used in this design is 485 serial communication. When using software programming, you need to click on "Communication" in the software and search for the PLC. After that, you can modify the IP address of the PLC, but the modified value is between 0 and 255. Configure communication. The port address of the RS485 communication port defaults to 2, with a baud rate of 9.6Kbps, 19.2Kbps, or 187.5Kbps. The modification steps for these two values are: click on the "System Block" to open the "Communication" dialog box, and then make the modifications.

Introduction to STEP 7-MicroWIN

The software used to write the program is STEP 7-MicroWIN. STEP7 Micro/WIN is a programming software specifically developed for S7-200 PLC. While adhering to the excellent programming philosophy of STEP7 Micro/WIN, STEP7 Micro/WIN's more user-friendly design makes programming easier to get started and project development more efficient. This software is short and compact, with an installation program of less than 100M. There are no special hardware requirements during installation, and common configurations are sufficient. It only requires 350M of free hard disk space, and the operating system can be Windows XP SP3 or Windows 7.

The program editor is the main programming area, where you can directly select the instructions to use in the toolbar and combine them to form a software program; The symbol table can specify symbol names for constants and memory addresses, improving program readability. These symbols are used in the global scope of the program; The symbols defined in the variable table are local variables that are valid for a specific POU; The status chart can be used to collect information after the program is downloaded to the PLC, and can be used to monitor and debug the program in two forms: chart and trend curve; Cross referencing identifies all operands used in the program, making it easy to understand the memory usage used in the program. Initial data values can be assigned to micro memory addresses through data blocks; The output window can output compilation information during program compilation, such as the size of program blocks and data blocks, compilation errors, etc; The status bar provides the cursor position in the program editor and the connection status of the S7-200 PLC.

Main program flowchart

The above flowchart is the main flowchart of this design. When the temperature and humidity in the computer room reach the set values, the air conditioner, dehumidifier, and humidifier will be turned on to make the temperature and humidity in the computer room reach a suitable level. When the temperature and humidity in the computer room reach the set values, the alarm system will process the alarm. When the UPS and smoke sensors transmit information to the PLC, the alarm will also be processed.

Interface Settings

The interface design uses FameView configuration software. Configuration software refers to the process of completing a specific task in a project using the tools and methods provided in the software. Overall, configuration software is a specialized software for completing data acquisition and process control. FameView configuration software has many advantages, not only can it be used in situations with few points, but also can be suitable for projects with large points. The most important thing is that the software fully supports Siemens PLC products.

From the main interface of the monitoring homepage, it is evident that the current temperature and humidity situation in the computer room environment, as well as the 24-hour flowchart, as well as whether the UPS power supply and smoke system are working properly. Of course, you can also click on air conditioning and other devices for remote control. The most important thing in computer room monitoring is to be able to query alarm signals. On the page, we can not only check for duplicate alarm signals, but also query historical data. Therefore, in configuration monitoring, we can perform real-time unmanned monitoring of the computer room.

V. CONCLUSION

In this graduation project, I learned about the components of the computer room monitoring system and gained a certain understanding and understanding of the hardware design of the monitoring system. When designing software and hardware for monitoring systems, it is also necessary to have a certain understanding of communication methods, as there are many communication protocols that hardware devices can communicate with, and different communication protocols may not be able to interact with each other.

In terms of hardware, the PLC of Siemens S7-200 in this graduation project uses the 485 serial communication protocol, so it is necessary to pay attention to whether the selected hardware can use this protocol for communication. Secondly, the PLC is a controller with limited RS485 ports, which requires the use of hardware to expand the ports and the use of a hub in the design. A hub is a basic hardware device whose main function is to regulate signals, enabling the controller to receive complete and accurate signals. When a hub is damaged on one port, it does not affect the normal operation of other ports.

In terms of software, it is necessary to conduct functional analysis on the system first, so as to ensure smooth thinking and get the desired results. When designing, it is necessary to reflect on and apply the knowledge learned. This design has drawn my attention to details that I did not pay attention to before, and has also applied what I have learned in college.

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