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Control Bus System And Application of Building Electric

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ABSTRACT As the most important part of Building construction, the electric part 's intelligent control is particularly important. the most important sign of The intelligent intelligent control is the application of control bus system, only select the appropriate control bus system, and achieve intelligent applications in buildings, elevators, fire, visualization, etc., can meet the household needs. Firstly, the design principle of the electrical control system will be described, and then the CAN - based bus system control principle and application are discussed, only used for reference.

KEYWORDS

Building electric

Control Bus System

CAN protocol

Introduction

For construction, the electric bus control technology is a relatively new technology. under the trend of the development of intelligent building in the future, application of control bus system has become the most important component of intelligent building . In the construction of the building, the control bus system can not only make real-time monitoring on the current state of the electrical equipment , can also control the device remotely over the network, thus ensuring the normal operation of electrical equipment to a large extent and achieve energy saving and environmental protection . So, modern intelligent building must focus on application of electrical control bus system.

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1.Design Principles of Electric Control System

As a primary prerequisite for intelligent building, Design of electrical control system should meet the following principles:

(1) It is needed to ensure meeting the needs under normal production environment . the mainstay of electrical system is designed to meet the production machinery and production process requirements. (2) The overall design concept should be clear. On the premise of meeting the design requirements, the whole design idea should be reasonable, the plan is simple and easy to maintain, not to blindly pursue quantitative indicators. (3) The mutual unification of mechanical design and electrical design . Mechanical design need electrical design to assist and cooperate it , so you need to make comprehensive consideration from the process complexity, rationality and effectiveness and several aspects , coordinating all aspects of the relationship [1]. (4) Guarantee system can run safely and reliably. With the rapid development of electrical design, the traditional electric drive has gradually shift to the electricity controller, More and more modern control mode has gradually reflected in the design environment, efficient

run of system run depends on the normal work of the various components, thus we should choose economic and safe way as far as possible on the premise of meeting the production process .

2.CAN bus overview

CAN is to control the local area network, the original design purpose is to control and monitor the car, With the continuous development of the technology , it is gradually applied to other areas. at the same time, ISO also includes CAN bus into the international standard , is the only one approved by the international standard in all types of field bus currently. The characteristics of CAN bus with support for multiple short frame structure is used in the main way to work, (including effective number of bytes per frame is 8) for signal transmission, CAN hang equipment more than 110, direct transmission distance up to 10 m / 5 KBPS, communication rate up to 1 MBPS / 40 m. the Basis is ISO/OSI, compared with other bus, it also has the characteristics of flexibility, real-time performance and reliability. real-time control , distributed control, and the secondary development can be made for serial communication network .

CAN bus protocol is based on the OSI, its were model structure only includes the OSI 's underlying physical layer, data link layer and application layer, guaranting the error-free data transmission between the nodes. CAN bus performs data transmission with two value "invisible" and "explicit" complementary logic "0" and "1" . provision of CAN2.0 A/B: free bus CAN_H and CAN_L voltage is 2.5 V. during data transmission, the dominant level (1) is CAN_H3. 5 v and CAN_L1. 5 v, invisibility level (0) is CAN_H2. 5 v and CAN_L2. 5 v, figure 1 is a numerical transmission mode for CAN bus [2].

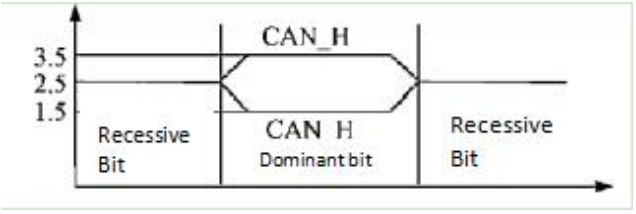


Figure 1 a numerical transmission mode of can bus

CAN bus communication distance can be up to 10 km, communication speed can reach 1 MBPS [3], table 1 for CAN bus on any two unit maximum distance with a speed corresponding to the table, CAN bus to support the maximum number of nodes and the corresponding circuit parameters are shown in table 2.

Table 1 maximum distance and speed for any two unit on can bus

Bit rate／Kbps	1000	500	250	125	100	50	20	10	5
Maximum distance／m	40	130	270	530	620	1300	3300	6700	10000

Table 2 the largest node number supported by can bus

chip type	$R_{Diff.min}$ ／KΩ	$V_{cc.min}$／V	$R_{L.min}$／Ω	number of nodes（$R_{T.min}$=118Ω）	number of nodes（$R_{T.min}$=130Ω）
TJA1050	25	4.75	45	131	170
PCA82C250	20	4.9	39	217	256
		4.9	45	105	136

From table 1, the CAN bus communication distance is a negative correlation with the communication rate, affected by the signal attenuation and waveform distortion, delay, etc. to ensure the reliable transmission of the signal, we should reduce the transmission rate, when the transmission distance is largest , the rate reduced to 5 KBPS. Because the

CAN bus transmit data using balance send and difference accepted way , restrain the common-mode interference, make its furthest distance up to 10 km. relative to the furthest RS485 communication distance of 1.2 km, CAN bus can well satisfy the industrial field data transmission. Table 2 illustrates the CAN bus CAN be articulated on the number of nodes depends on the bus driver circuit, when the minimum differential input resistance, minimum supply voltage and minimum dc resistance to timing, terminal resistance, the greater the smallest CAN be articulated node number, the more the more the number of nodes CAN meet the requirements of the scene to collect more.

3.Application of CAN bus system in the building electrical

3.1 building automation system of CAN bus

3.1.1 hardware design

Hardware design scheme design of the program is: on the signal characteristics of each node measurement quantity, type, number and so on are defined; For example in the design of buildings, according to the actual needs of buildings, the design of the building automatic system monitoring center, including subsystems of automatic meter reading, fire alarm, power outage alarm subsystem, temperature measurement and control subsystem, based on its system and its running state monitoring, diagnosis, intelligent node login, etc., for the building of the network management functions, effective control and operation of the node.

The overall structure of the temperature measurement and control node is designed to: master control chip using 89 c51, the physical line interface of the microprocessor USES SJA1000CAN controller, while the interface between the physical bus and the CAN controller through CAN bus driver 82 c250 implementation. In the connection of the LED display, keyboard and other peripheral equipment parallel interface expander with 8155. Fixed point temperature acquisition using DS18B20. The temperature data acquisition module is the first to use 1 - Wire single bus technology, information transmission three buses, namely control, address, data transmission, and through the technology needed to feed the node power supply. And with its development, a new single bus chip products, such as micro LAN coupler, ID digital sequence, ESD protection diode, line driver, addressing block switch, EEPROM and RAM memory, timer, digital thermometer, etc, facilitate the multipoint data monitoring site.

3.1.2 software design

The building automation system based on CAN bus software design of the main program for: (1) the system initialization Settings; (2) launch event handling and checking the subprogram; (3) according to the actual situation to determine whether there is a key press and call the function key subprogram; (4) to set the current value, voltage, temperature, etc; (5) call display subroutine, through the LED shows the corresponding current, voltage, temperature, etc; (6) using subroutines, data transmission using CAN bus to acquisition of data sent to the monitoring center.

In processing subroutine, the action of its operation is often determined by comparing setting threshold and sampling data, in order to make the data, the security of the system can be reduced using instability caused by the error, avoid accidental factors caused by the fluctuation, in dealing with the initial samples values often use median filtering program. Change the essence of the program design is according to from big to small, from small to large, the order of N samples values and extract N samples values in the middle of the values, the first address is placed in the area of data set as R0, then compared with R0 R0 1, if R0 smaller don't need to move, if R0 is larger then need to switch the location of the two data. Until the data in the ranking will be the biggest. In this way and efficient processing events [5].

3.2 Elevator group monitoring system of CAN bus

Elevator group control system mainly covers the elevator group control system and the elevator monitoring system of two parts. Elevator group control system is more than one elevator group, according to the change of traffic volume of the building, using optimization algorithm for optimal conveying the operation mode of the crowd. Elevator monitoring system is the above installed in different location of the elevator group, through has the selected communication lines using CAN bus to centralized monitoring and management for the elevator data, maintenance, statistics, analysis, fault diagnosis and rescue. Elevator group control system overall scheme is shown in figure 2. As can be seen from the figure 2, the elevator group control system is mainly composed of the elevator group control, elevator control system and elevator monitoring system. The elevator group control device is the entire group control system scheduling command center, responsible for all the operation of the elevator control. Elevator group control mainly through with the elevator main controller between the communication, collect call of each floor of the hall call device signal, according to all the position of the elevator group control group, operational direction, load and traffic demand factors such as to make the optimal distribution of layer station call, and through the CAN bus to summon the task sent to the specified elevator controller.

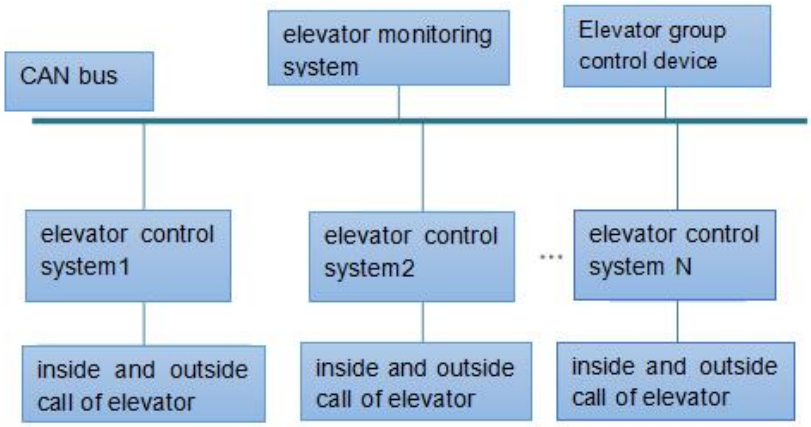


figure 2.overall scheme of Elevator group control system

Implementation of elevator group allocation algorithm needs to have matching module, the module is mainly composed of the following several modules:

1) the main module. The module for the elevator control center, is responsible for the deployment of other modules to work together, the flow chart shown in figure 3 [6].

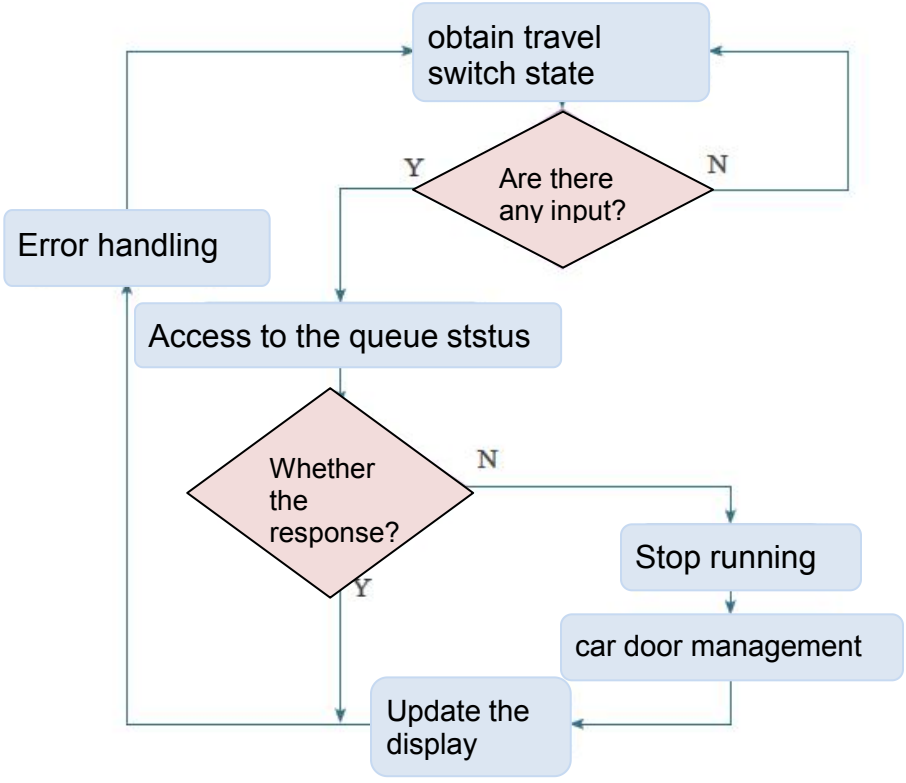


FIG. 3 flow chart of main control module

2)call management module. The module function to accept outside calls and divided it into the correct queue, is responsible for maintaining the shout shout two queues and the queue of each element on the position of the elevator, and provide the address of two queues.

3)time calculation module. The function of the module is based on passing into the parameter calculation of response time and return time information.

4)minimum time management module. The module function to maintain the smallest N response time queue.

5)module. This module is responsible for the entire queue sorting.

6) output module. This module is responsible for the management module based on the minimum time access to information, call to elevator to send signals and recorded delivery.

Table 3 the elevator group control system hardware selection list

	Component unit	type	The selected modules
1	Panel unit	Main controller	AT89C55
2	Unit CAN intelligent node	CAN bus controller	SJA1000
		CAN bus transceiver	PCA82C250
		The photoelectric coupler	6N137
	Alarm unit	Power supply chip	MAX232
		Transparent latch	74LS373
		Guard dog	MAX813

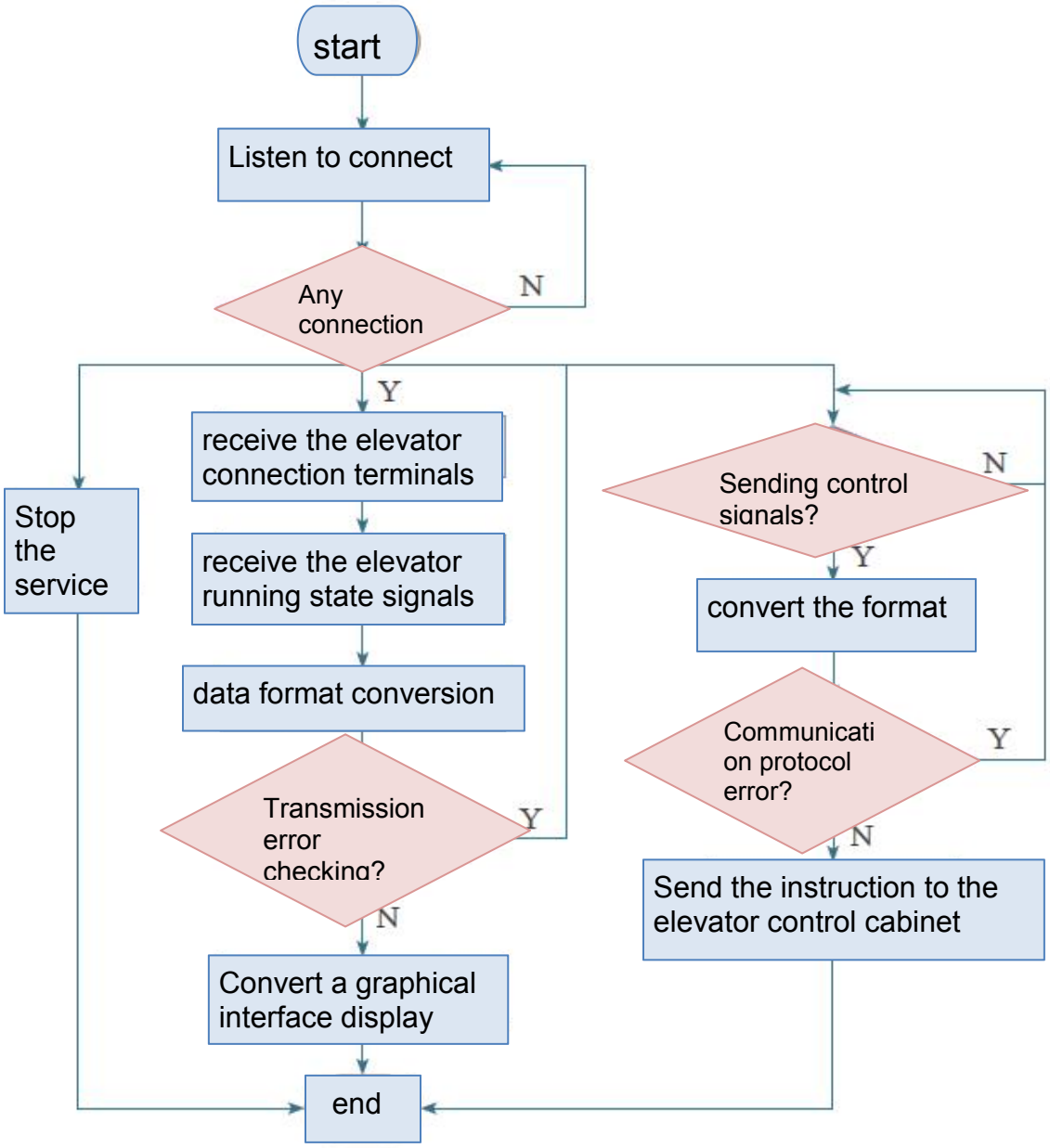
3.2.1 hardware design

The hardware of the monitoring system is mainly including the control panel of the controller, CAN bus controller and CAN bus transceiver. Each hall box node as an intelligent CAN node, for information of echo, capsules capsules in the box, the top box is also CAN intelligent node. The CAN controller's main function is to realize the CAN bus protocol and interface circuit with a micro controller part [7]. PCA82C250 between the CAN protocol controller and the physical bus interface, the device on the bus provides differential ability to send, and provide the differential capacity of the CAN controller. PCA82C250 support up to 110 nodes, so that it can completely meet the actual needs of this system, and can realize the standardization of the interface, can be improved by increasing the optical coupling and transmission accuracy. The system hardware listing are shown in table 3 below.

3.2.2 software design

Elevator monitoring system software design USES the modular structure design thought, according to different perform different function design of software modules, including the main program, data acquisition program, test and fault diagnosis expert system. The working process of the main program as shown in figure 4. After the electric monitoring system, monitoring program starts executing, starting the elevator monitoring service, if there is a monitor connection monitoring system began to listen. When the system receives the connection request from the elevator terminal, monitoring and control system began to implement the monitoring of running status of the elevator, or continue to listen to the connection. After receives the information of elevator running, the system began to the elevator operation information data format conversion, after receive after conversion of data and check and correct, the elevator running data information of the converted into graphical information, monitor interface displayed in the center of the elevator monitoring [8]. Elevator running in the receiving data information at the same time, the monitoring system also monitor whether there is a elevator control signals from the monitoring center computer, if you have the elevator control signal, the control signal is converted into a specific format, the control information is sent to the elevator control cabinet after testing, so as to realize the monitoring host the simple control of elevator running on the spot.

Figure 4 elevator group manager application workflow



3.3 visual talk-back system design

For visual system, the simple understanding is in a traditional add video intercom system, so that it can complete the intercom and visual function. General visualization system of the camera is installed above the door, and the camera matching with and light Settings. In order to avoid the condition of the damaged camera, the camera should be installed in a more hidden place. When have to the person to visit, will signal transmitted to the visitors to visit on the extension of the residents, the residents and visitors can through this system to carry on the video calls, to determine the identity of visitors, to choose whether to open the security door.

Research chooses in the visual system can not only complete video intercom, and integration of the fingerprint identification technology, can effectively enhance the technological content of the whole system, guarantee the safety of the residents in the neighborhood. And for the selection of equipment, the need to its fingerprint identification has a faster speed, waterproof, and other functions. At the same time, the system can not only through the fingerprint to unlock, but also can through the use of credit card and password to unlock, can effectively enhance the overall system availability [9].

Hardware core selection is AT89C51 chip, not only has 8 k FLASH, and has low power consumption, in the actual application is good for building the visual system. In the actual application is mainly for each signal, judgment, and delay processing. The work steps as follows: The first step is to confirm button, after confirm button will according to the requirement of the key accounts camera and voice function, video information and voice information in the process of transmission is in the form of digital signals. When transferred to the owner and visitor to transform, output signal and video signal, so as to complete the overall process of visual system. At the same time, the control function of the AT89C51 is also responsible for security doors open.

In addition, the system and other peripheral circuit, such as in speech recognition, this system USES the MT8880, the peripheral circuit is shown in figure 5. And power supply circuit module, communication module, etc.

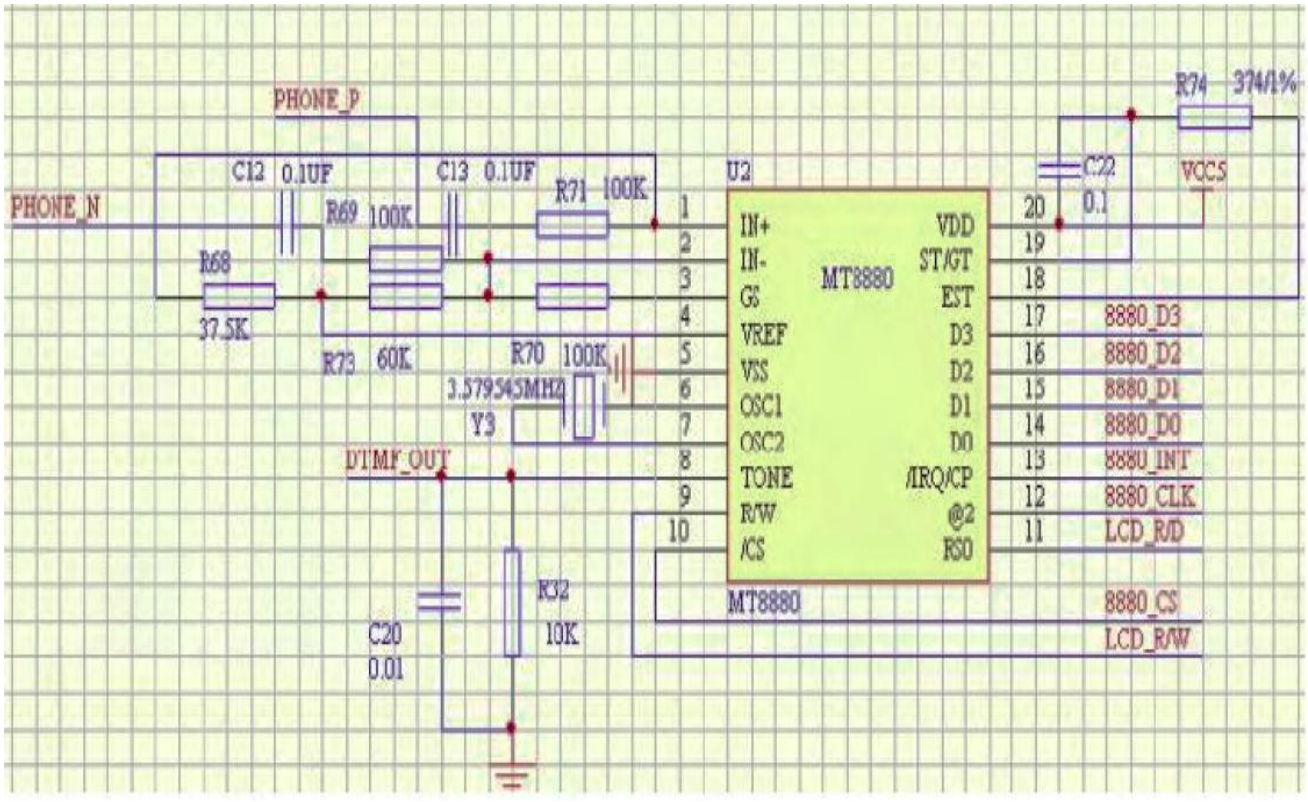


Figure 5 the speech recognition circuit diagram

3.4 wireless alarm system design

Alarm system mainly include two aspects of fire and the police. Every household intercom system has integrated the alarm system of nature, this section mainly analyzes the fire alarm and research. In order to better alleviate the harm caused by the fire, on the one hand need everyone starts from oneself, reduce the risk behavior may cause fire, on the other hand also need full application of information technology in the home, when appear the symptom of the fire alarm, no range to fire killed in the cradle.

3.4.1 track of fire control system overall design analysis

For community fire control system, the main use of bus control technology, in all areas in the community set up monitoring device, sprinkler systems and alarm systems, monitoring of when preparing to appear immediately when there's a fire alarm to the property management, fire brigades, in order to improve the overall efficiency of monitoring and control of fire.

3.4.2 the laying of power circuit analysis

In order to better control the village problem of fire in the process of the laying of power circuit, the fire alarm circuit should choose 1-1.5 was the copper cable, line flame retardant line should be used in the alarm system. Fire alarm system in laying the metope of the line shall be coated with fireproof material, to ensure the line in the event of a fire can normal work, have the effect of alarm.

3.4.3 fire control system hardware

The realization of fire control system is mainly in the research of application of the CAN bus technology, used as CAN bus controller SJA1000, its driving circuit is shown in figure 6.

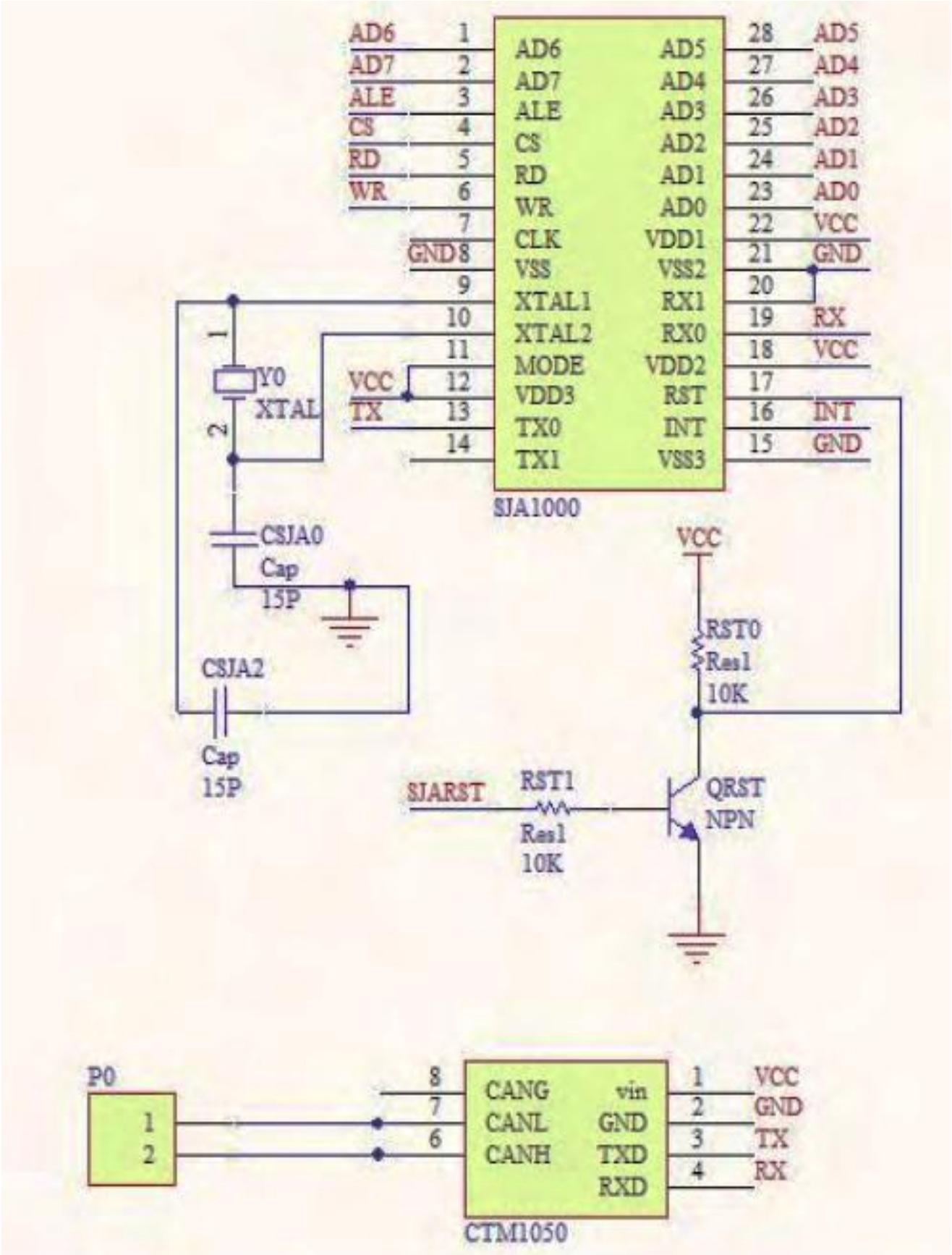


Figure 6 CAN bus driver circuit

Through driving circuit CAN guarantee the CAN bus technology in the process of work CAN normal communication, and drive circuit is used STC15F2K60S2 chip [10]. In order to achieve a CAN bus technology and computer for effective communication, to better complete the fire alarm.

Conclusion

In a word, CAN bus showed communication speed, distance, CAN hang the node and good fault tolerance, more for the whole system made strong communication security of data transmission. Form of DCS system has good stability, high reliability, easy maintenance. CAN bus management center for the customer and field data transmission provides a good communication; In this paper, through summarizing, hope for building electric control bus system using personnel provide reference, for the building electric control bus system in the development of our country to provide the reference.

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