35kv Smart substation Alarm System Base on GSM Wireless Net

Ji Zou [1, a], Jie Zheng [1], Chao Zhang [1], duanyuan Bai [2]

[1]Electronic and Information Engineering College, Chang Chun University, Chang Chun 130021, China

[2]Electronic and Information Engineering College, Chang Chun University of Science and Technology, Chang Chun 130021, China

[a]7317421@qq.com

Abstract

This paper mainly studies 35 KV Smart substation alarm system based on GSM net, the key of design is construction scheme and alarm problems that should be paid attention in the design. The most important problem is that single-chip microcomputer control GSM module to send and receive text alarm messages, this paper expounds the design scheme of GSM net wireless terminals, development methods and development process. The system can send and receive SMS wireless Modem prototype and realize the start-up circuit with IGT with a object-oriented software design method. The microcontroller programming, the two serial port to read and write with polling mode. Next job is to improve the system stability, and develop the application of data acquisition on the basis of this prototype.

Keywords

35KVsmart substation; GSM net; Short message;Single-chip.

1. Introduction

The original 35KV smart substation control and protection system for electromagnetic relay, wiring complexity, poor accuracy, relatively restricted the development of electric power enterprises. According to the development plan, scheme of unmanned substation can be divided into two cases, namely ,substation new-built and substation retrofit .Generally, new substation adopts a long repair cycle or free maintenance, and higher reliability of the primary equipment; About secondary equipment, it usually uses microcomputer remote monitoring equipment and comprehensive automatic system to achieve all the equipment in the substation remote control.

35 kV Smart substation overview.This article mainly from 35 kV Smart substation design points, the miniaturization of the Smart substation construction and the attentions of 35 KV substation construction and retrofit .This paper will do a brief overview of current 35 kV Smart substation from this 3 aspects.

2. 35 kV Smart substation design key points are as follows:

(1) the Smart substation main electrical wiring design should meet the reliable running, simple and flexible, convenient operation, easy maintenance and save investment requirements.

(2) the choice of main transformer unattended station, the capacity of the main transformer should be determined according to 5 ~ 10 years of development planning. Currently, the dry type transformer got a large number of promotion and application, also, dry type transformer maintenance workload small, which is suitable for Smart substation.

(3) 35 KV substation unattended modification according to the actual situation. About substation unattended modification, it mainly used FJY - 1-004 type to realize the remote control of substation. FJY - 1-006 type function board to realize remote communication function. FYJ - type 1 remote control panel is used to implement remote control functions of the substation.

3. Miniaturization of Smart substation construction :

Electrical primary design: the sulfur hexafluoride switch, main transformer two, all adopt KFE type automatic reclosing. 35 KV bus bar respectively installed lightning arrester on each a set.

Electrical secondary design: in order to adapt to the needs of unattended and dispatching automation, in the part of electrical secondary design, adopting advanced microcomputer technology to realize the microcomputer protection and monitoring.

4. 35KV substation should be paid attention to in the construction and retrofit on four aspects:

(1) operating circuit: At present , 35 KV circuit breaker mainly choose vacuum circuit breaker or SF6 circuit breaker. The circuit design must lead spring contact and SF6 density relay contacts to intermediate relay protection screen, using some intermediate relay junctions to closure, others to signal.

(2) the capacitor automatic cast: In order to realize the unattended, capacitor should have automatic cast function.

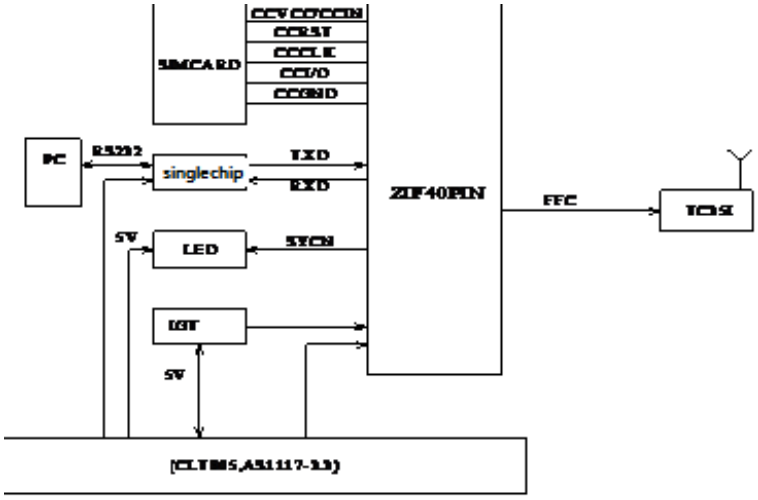
(3) grounding line selection function: for the Smart substation , weather achieving the grounding line selection tripping is a big problem. Once a line dropped onto the ground, we must sent people to rush to the scene, which will make sending time delay.

(4) Problem of measurement

5. Introduction of short message

Short message business is divided into two kinds: point to point short message (SMS - PP), and the broadcast messages (SMS - CB). Short message service provided by the GSM system can make network side know whether the called parts receive messages.

Currently, the latest version of SMS agreement is the GSM07 series, The definition of short message delivery mode in GSM07.05 protocol is as follows：block mode, text mode, PDU mode. Currently, short message sending usually adopts Text and PDU mode.



Pic1. TC35i peripheral hardware circuitdiagram of the system

5.1 GSM module TC35i peripheral hardware circuit design

This design choose the Siemens TC35i GSM module, IGT signal is very important to control TC35i module, only correct IGT signal can be TC35i mode to normal operation. Power circuit is mainly composed of two three-terminal voltage regulator power supply modules.

5.2 C8051F020 linked with TC35i circuit of serial port

TC35i mainly completes short message sending and receiving , communicating with MCU, software flow control, etc. Because the TC35i use 5V power supply, MCU use 3.3V power supply, so we should consider the electrical balancing relationship between TC35i and MCU. According to the manual , C8051F020 and TC35i can communicate directly.

To facilitate the software programming, we need write some underlying drivers in view of the hardware. Microcontroller control TC35i through the serial port, control methods using standard AT command set. Short message sending, the user data coded in PDU format. Software hierarchy in picture 2.

application layer
PDU protocol
SMS protocol
TC35idriver
serial driver

Pic2.Software hierarchy chart

5.3 The front desk software design

The front desk software as a short message sending and receiving manager communicates with single-chip microcomputer and TC35i via a serial port .

serial port control

Control part mainly according to the serial port parameters of user Settings to complete serial connection, disconnection, set its parameters including the selection of a serial port, serial port communication rate, data bits, parity and stop bits.

The string sending and receiving by serial port

Generally speaking, the computer has one or many serial ports, they in turn as Com1, Com2. Microsoft MSCOMM provides a series of standard communication interface. It is simple to control data to send by using MSCOMM .

Short message management

The short message on the SIM card can be read, deleted through this module. The module can also send short messages to a particular mobile phone. If TC35i receive a short message, it will send a notice. When the program of listening serial port receives the notice, it will display the contents of short message to the text box.

5.4 The design of Single-chip program

C8051FO20 microcontroller is applied in this system, timing UARTO connects PC receiver or sending data acquisition machine, UARTI connects TC35i module, both serial ports aer two-way communication, so the single-chip microcomputer can control TC35i to send and receive data.

5.5 Program design

This system adopts C51 microcontroller programming language to develop, the completing and debugging of programming is in Kei1C integrated development environment.

6. Conclusion

IN this design,GSM wireless terminal make full use of the single-chip microcomputer internal resources, as much as possible to improve the reliability and accuracy. The completion of the system via component selection, schematic design, PCB production, system hardware and software debugging and so on several stages. To meet project requirements, this system has achieved the purpose of message sending and receiving treatment in both English and Chinese. Next task is to improve the system stability and develop the application of data acquisition on the basis of this prototype.

Reference

[1] TC35i Engine Hardware Interface Description. www.siemens.com.2003
[2] Siemens Cellular Engine AT Command Set.www.siemens.com.2003
[3] GSM 07.05 version 7.0.1.ETSI.1998
[4] ASlll7 800mA Low Dropout Regulator SCSI-II Active Terminator.www.alpha.com
[5] Tan Yi. "several opinions of Smart substation design. Guangxi electric power technology. 2000.03
[6] Yao Yu, tie-sheng Zhou. The design of 35 kv box substation. Rural electrification of 2004.12.