

## Design of temperature acquisition and monitoring system based on VB6.0 and 51 single chip microcomputer

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### Abstract

Temperature is a basic physical parameter in the process of industrial and agricultural production. The real-time and accurate temperature collection and monitoring is an important guarantee for the quality of the product. With the development of modern science and technology, single chip microcomputer has been used more and more in the control of temperature. In this paper, we collect and control the temperature of each point by lower computer(single chip microcomputer), besides, a temperature information management system is established by VB, and the design method and function of the system are described in detail. It realizes the real-time data communication with the measurement and control circuit of temperature, and completes the upload of temperature information and the return of the setting-value of temperature. The host computer uses VB software to complete functions such as acquisition, display, trend chart and report generating of temperature information. It achieves the acquiring of real-time temperature information, alarming at upper and lower limits of temperature, and what time motor needs to start or stop. The monitoring system has good human-machine interface, nice universality, simple and convenient operation and it is easy to realize centralized monitoring and management of temperature. It has wide application prospects.

### Keywords

Temperature acquisition and monitoring system, VB software, single chip microcomputer.

### 1. Introduction

In modern signal acquisition and monitoring system, single chip microcomputer has many advantages: convenient signal collection, simple operation, low cost and high reliability, so it is widely used in temperature signal acquisition, however, the disadvantage of the microcontroller is obvious—function of man-machine interface is weak, we can't see some physical parameters clearly such as temperature signal that we collected. Especially, when we need to collect multichannel signal and to display them, displaying of the parameters by digital tube is too complicated. Nowadays, the man-machine interface on PC has got a high level development. VB6.0 running on the Windows operating system, is a kind of object-oriented programming language, VB6.0 provides a visual programming tool, and it provides a rich graphical object to the programmer (windows, controls, menu interface design for application) to design the program, which makes the man-machine interactive function is very powerful, to make up for the deficiency of single chip microcomputer's weak displaying interface, we use single chip microcomputer to realize data acquisition, use PC to display data, So we can finish the design of temperature acquisition and monitoring system. The main work of this paper are: using DS18B20 digital temperature sensor to collect vegetable greenhouse temperature, using STC89C52 microcontroller to send the collected temperature to the VB6.0, designing programs of microcontroller, designing temperature display interface with VB6.0 on PC.

## 2. Device selection and design of hardware circuit

### 2.1 Sensor selection and temperature acquisition circuit

According to the working environment and the sensor measuring range of temperature, we choose the digital temperature sensor DS18B20 produced by American DALLAS semiconductor company, the so-called digital sensor means it is not necessary to convert analog value to digital value and the collected temperature will be converted to digital value directly, then delivered to the MCU I/O port, and serially output in a form of digital code, thus we can simplify the interface circuit between SCM and the sensor. The performance parameters of DS18B20 are as follows: voltage range from 3 to 5.5V, temperature range from -55 to +125, a programmable resolution of 9 to 12 bits.

The interface circuit between sensor and MCU is shown in Figure 1: the GND terminal of the sensor is grounded, the VCC terminal is connected to the 5V power supply, in which a 4.7kΩ resistor is serially connected, and the DQ terminal and VCC are connected to the P2.6 port.

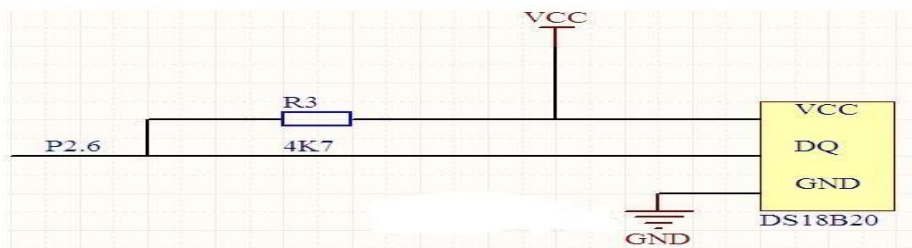


Fig1. interface circuit between DS18B20 and MCU

### 2.2 Serial communication circuit

PC serial port is RS232, the level characteristic is as follows: range of logic 1 is -3V to -15V, range of logic 0 is 3V to 15V. The serial port of MCU is TTL, logic 1 is 5V, logic 0 is 0V. Because of their different level, they can't communicate with each other directly. It needs level conversion by MAX232 chip, and conversion circuit diagram is shown in Figure 2:

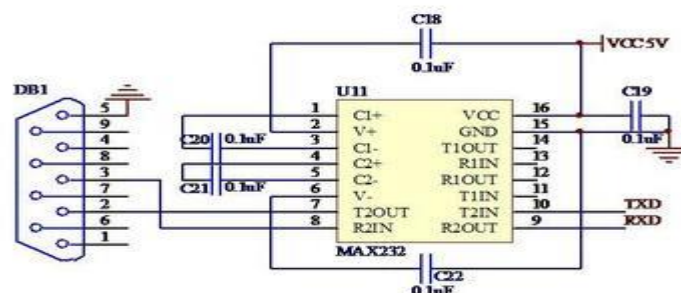


Fig2. logic conversion circuit between RS232 and TTL

## 3. C programming language on single chip microcomputer and annotation

The main work of this paper is the program design on single chip computer and the VB6.0 interface on upper computer, the C programming language is as follows.

```
#include<reg52.h>
#include<stdio.h>
#define uchar unsigned char
#define uint unsigned int
sbit ds=P2^6; //define signal line of sensor
sbit motor=P2^3; // Open the motor when the temperature is too low
uint temp; //define integer temperature variable
float f_temp; // define float temperature variable
uint lowtempm=250; //define lower limit of temperature
```

```

void delay(uint z) //delay function
{uintx, y;
for(x=z;x>0;x--)
for(y=110;y>0;y--);}
void dsrest(void) // DS18B20 reset, initial function
{uint i;ds=0;i=103;
while(i>0)i--;
ds=1;i=4;
while(i>0)i--;}
bit tempreadbit(void) // a function that reads one bit
{uint i;bit dat;ds=0;i++;
ds=1;i++;i++;
dat=ds;i=8;while(i>0)i--;
return(dat);}
uchar tempread(void) // a function that reads one byte
{uchar i, j, dat;dat=0;
for(i=1;i<=8;i++)
{j=tempreadbit();dat=(j<<7)|(dat>>1); } //put the least bit in head,
return(dat);} //variable dat contains one byte
void tempwritebyte(uchar dat) // write one byte into DS18B20
{uint i;ucharj;bit testb;
for(i=1;i<=8;i++)
{testb=dat&0x01;dat=dat>>1;
if(testb)
{ds=0;i++;i++;ds=1;i=8;while(i>0)i--;}
else{ds=0;i=8;while(i>0)i--;
ds=1;i++;i++;}} }
void tempchange(void) //DS18B20 starts to get temperature and convert
{derest();
delay(1);tempwritebyte(0xcc);tempwrite(0xbe);
a=tempread();b=tempread();temp<<=8;temp=temp|a; //read lower 8 bits,
//read higher 8 bits,
//link lower 8 bits and higher 8 bits to a word
f_temp=temp*0.0625;temp=f_temp*10+0.5;f_temp=temp+0.05;return temp;}
void deal(uint t)//if temperature is lower to 25°, then start the motor
{if(t<lowtemp)motor=0;}
void init_com()//initiate the serial port
{TMOD=0X20;PCON=0X00;SCON=0X50;TH1=0XFD;TL1=0XFD;TR1=1;}
void comm(char*parr) //sending function of serial port
{do
{sbuf=*parr++;while(!TI);TI=0;}while(*parr)} }
void main() //main function

```

```
{uchar buff[4], i;
init_com();
while(1){tempchange();deal(temp);sprintf(buff, "%f", f_temp);comm(buff;}}
```

#### 4. The development of the upper computer interface and programming in VB language.

The frequently-used controls of VB on the left toolbar are: picture box, text box, label, frame, button, timer, list box, etc., Double click on the required controls to move it in the form. The running interface is shown in Figure 3. VB program design and annotation are shown in Figure 4.

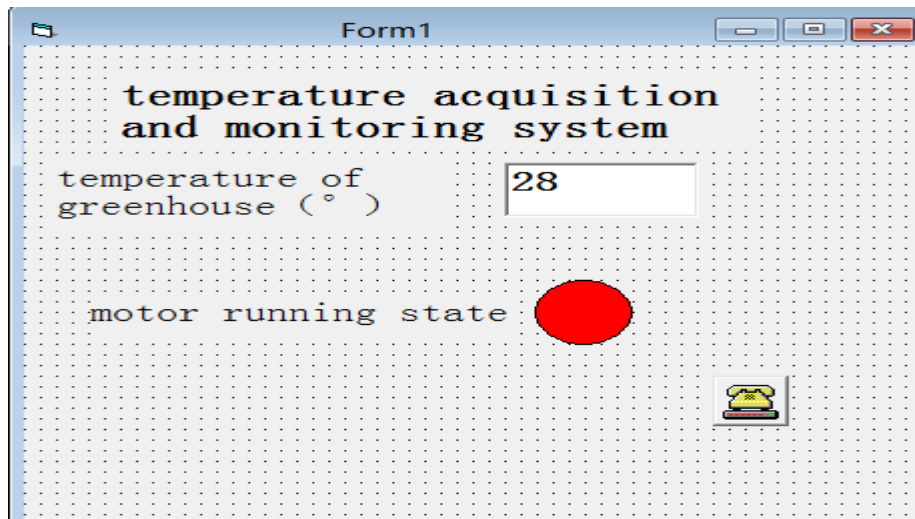


Fig3. VB interface

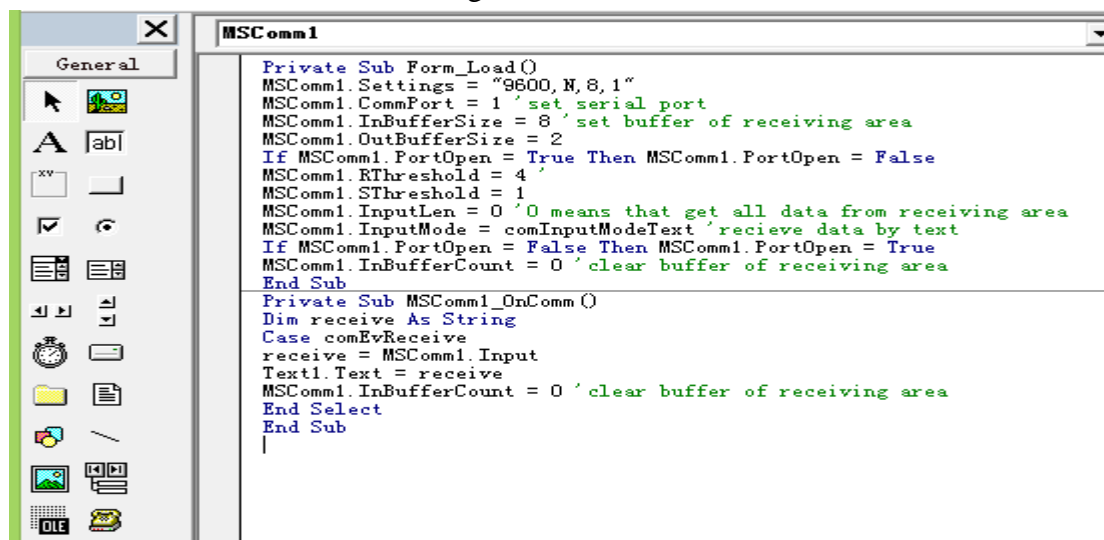


Fig4. VB program

#### 5. Conclusion

The design has been applied in the field of collecting and monitoring the temperature of vegetable greenhouse. The effect is remarkable and the benefit is improved. If we change the interface circuit and the modify the parameters in the program, the system can be applied to the acquisition of other signals.

#### References

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