实验四 三线制实时时钟的读写

实验目的：

(1) 掌握 IIC 总线的使用方式
(2) 掌握实时时钟芯片 DS1302 的工作原理
(3) 掌握三线制方式实现时钟芯片 DS1302 的数据读写

实验内容：

学习三线制传输机制，通过单片机 MCU 的 I/O 实现三线制方式读取 DS1302S 时钟数据并分别将年、月、日、时间信息分别显示在数码管上。

参考资料：芯片手册文档，

实验步骤：

（1） 编写 DS1302 读写程序，和数码管显示程序。
（2） 编写按键程序，实现不同按键显示年、月、日、时间等信息。

实验要求：

编写实验报告，主要包括关键步骤的实现和效果截屏，并分析实验过程中出现的问题和分析解决方法。

一、代码实现

Main 文件

```
#include "reg51.h"
#include "LCD1602.h"
#include "DS1302.h"
#define uchar unsigned char
#define uint unsigned int
bit key_flag1=0, key_flag2=0;
SYSTEMTIME adjusted;

#define KEY_MATRIX_PORT P1          //使用宏定义矩阵按键控制口



uchar sec_add=0, min_add=0, hou_add=0, day_add=0, mon_add=0, yea_add=0;
uchar data_alarm[7]={0};
uchar test[6] = "        C";

int key_scan()
{
        int i=0;
        uint temp;
        P1=0xF0;
        temp=P1;
        if(temp!=0xF0)
        {
                i=1;
                test[5]='C';
        }
        else
        {
                i=0;
        }

        return i;
}

uchar key_value()
{
        uint m=0, n=0, temp;
        uchar value;
        uchar v[3][4]={'0','1','2','6','3','4','5','7','8','9','A','B'};
        P1=0xfe;temp=P1; if(temp!=0xfe) m=3;
        P1=0xfd;temp=P1; if(temp!=0xfd) m=2;
        P1=0xfb;temp=P1; if(temp!=0xfb) m=1;
        P1=0xf7;temp=P1; if(temp!=0xf7) m=0;
        P1=0x7f;temp=P1; if(temp!=0x7f) n=0;
        P1=0xbf;temp=P1; if(temp!=0xbf) n=1;
        P1=0xdf;temp=P1; if(temp!=0xdf) n=2;
        value=v[n][m];
        return value;
}

void adjust(void)
{
        if(key_scan()&&key_flag1)
        {
                switch(key_value())
                {
                    case '5':adjusted.Second++;test[5]='S';break;
                    case '4':adjusted.Minute++;test[5]='M';break;
                    case '3':adjusted.Hour++;test[5]='H';break;
                    case '2':adjusted.Day++;test[5]='D';break;
                    case '1':adjusted.Month++;test[5]='M';break;
                    case '0':adjusted.Year++;test[5]='Y';break;
                    //case '7':Save_Time(&adjusted);break;
                    default:test[5]='C'; break;
                }
                if(adjusted.Second>59)
                {
                    adjusted.Second=adjusted.Second%60;
                    adjusted.Minute++;
                }
                if(adjusted.Minute>59)
                {
                    adjusted.Minute=adjusted.Minute%60;


                    adjusted.Hour++;
                }
                if(adjusted.Hour>23)
                {
                    adjusted.Hour=adjusted.Hour%24;
                    adjusted.Day++;
                }
                if(adjusted.Day>31)
                {
                    adjusted.Day=adjusted.Day%31;
                    adjusted.Month++;
                }
                if(adjusted.Month>12)
                {
                    adjusted.Month=adjusted.Month%12;
                    adjusted.Year++;
                    //test[5]='O';
                }
                if(adjusted.Year>100)
                {
                    adjusted.Year=adjusted.Year%100;
                }
                Save_Time(&adjusted);
        }
}

void changing(void) interrupt 0 using 0
{
        if(key_flag1)
        {
                key_flag1=0;
        }
        else
        {
```

```
		key_flag1=1;
	}
}

void main()
{
	uint i;
	uchar p1[]="D:", p2[]="T:";
	SYSTEMTIME T;

	EA=1;
	EX0=1;
	IT0=1;
	EA=1;
	EX1=1;
	IT1=1;
	init1602();
	Initial_DS1302();

	while(1)
	{
		write_com(0x80);
		write_string(p1, 2);
		write_com(0xc0);
		write_string(p2, 2);
		if(key_flag1==0)
		{
			DS1302_GetTime(&T);
			adjusted.Second=T.Second;
			adjusted.Minute=T.Minute;
			adjusted.Hour=T.Hour;
			adjusted.Day=T.Day;
			adjusted.Month=T.Month;
			adjusted.Year=T.Year;
			for(i=0; i<9; i++)
			{
				adjusted.DateString[i] = T.DateString[i];
				adjusted.TimeString[i] = T.TimeString[i];
			}
		}
		else
			adjust();
		DateToStr(&adjusted);
		TimeToStr(&adjusted);
```

```
                        write_com(0x82);
                        write_string(adjusted.DateString, 8);
                        if(key_flag1)write_string(test, 6);
                        else write_string("      ", 6);
                        write_com(0xc2);
                        write_string(adjusted.TimeString, 8);
                        if(key_flag1)write_string(test, 6);
                        else write_string("      ", 6);
                        delay(10);
            }
}
```

DS1302.h

```
#ifndef TIMER_DS1302
#define TIMER_DS1302
sbit DS1302_CLK = P3^6;//实时时钟时钟线引脚
sbit DS1302_IO = P3^4;//实时时钟数据线引脚
sbit DS1302_RST = P3^5;//实时时钟复位线引脚
sbit ACC0 = ACC^0;//定义 ACC 的最低位和最高位,在对 ACC 移位操作后,用于传输数据
sbit ACC7 = ACC^7;
typedef struct SYSTEM_TIME
{
unsigned char Second;
unsigned char Minute;
unsigned char Hour;
unsigned char Week;
unsigned char Day;
unsigned char Month;
unsigned char Year;
unsigned char DateString [9];//用这两个字符串来放置读取的时间
unsigned char TimeString[9];
}SYSTEMTIME; //定义的时间类型结构体
#define AM(X) X
#define PM(X) (X+12) //转成 24 小时制
#define DS1302_SECOND 0x80 //片内各位数据的地址
#define DS1302_MINUTE 0x82
#define DS1302_HOUR 0x84
#define DS1302_WEEK 0x8A
#define DS1302_DAY 0x86
#define DS1302_MONTH 0x88
#define DS1302_YEAR 0x8C
#define DS1302_RAM(X)(0xC0+(X)*2)
//用于计算 DS1302_RAM 地址的宏
```

```
/******内部指令***★★***★*吉*★*/
void DS1302InputByte(unsigned char d)    //实时时钟写入 1B(内部函数)
{
        unsigned char i;
        ACC=d;
        for(i=8;i>0;i--)
        {
                DS1302_IO=ACC0;
                DS1302_CLK=1; //写数据在上升沿,且先写低位再写高位
                DS1302_CLK=0; //因为在前面已定义 ACCO=ACC^0;以便再次利用
                ACC=ACC>>1;
        }
}
//函数功能:实时时钟读取 1B(内部函数)
unsigned char DS1302OutputByte (void)
{
        unsigned char i;
        for(i=8; i>0; i--)
        {
                ACC=ACC >>1;
                //相当于汇编中的 RRC
                ACC7=DS1302_IO;
                //由低位到高位传播 AcC7 中的信息
                DS1302_CLK=1;
                //读信息是在下降沿
                DS1302_CLK=0;
        }
        return(ACC);
}
void Write1302(unsigned char ucAddr, unsigned char ucDa) //ucAddr: DS1302 地址,
{
        //ucData:要写的数据
        DS1302_RST =0;
        DS1302_CLK =0;
        DS1302_RST =1;
        DS1302InputByte(ucAddr) ;
        //地址,命令
        DS1302InputByte(ucDa);
        //写 1B 数据
        DS1302_CLK =1;
        DS1302_RST =0;
}
unsigned char Read1302(unsigned char ucAddr) //读取 DS1302 某地址的数据
{
        unsigned char ucData;
        DS1302_RST=0;
        DS1302_CLK = 0;
        DS1302_RST =1;
        DS1302InputByte(ucAddr|0x01);
        //上升沿,写地址,命令
        ucData = DS1302OutputByte();
        //下降沿,读 1B 数据
        DS1302_CLK =1;
        DS1302_RST =0;
        return(ucData) ;
        //在上升沿之后进行写操作,在下降沿之前进行读操作
}
void DS1302_SetProtect(bit flag) //!是否写保护
{
        if(flag)
                Write1302(0X8E,0x80);
        else
                Write1302(0X8E,0x00);
}

void DS1302_SetTime (unsigned char Address,unsigned char Value)//函数功能: 设置时间
{
        DS1302_SetProtect(0);
        Write1302(Address, ((Value/10)<<4 | (Value%10)));//将十进制数转换为 BCD 码
}
//在 DS1302 中的与日历、时钟相关的寄存器存放的数据必须为 BCD 码形式
void DS1302_GetTime (SYSTEMTIME *Time)
{
        unsigned char ReadValue;
        ReadValue = Read1302(DS1302_SECOND);
        Time->Second = ((ReadValue&0x70)>>4)*10 + (ReadValue&0x0F);//将 BCD 码转换为十进制数,此处为结构体操作
        ReadValue = Read1302(DS1302_MINUTE);
        Time->Minute =((ReadValue&0x70)>>4)*10 +(ReadValue&0x0F);
        ReadValue = Read1302(DS1302_HOUR);
        Time->Hour =((ReadValue&0x70)>>4)*10+(ReadValue&0x0F);
        ReadValue = Read1302(DS1302_DAY);
        Time->Day =((ReadValue&0x70)>>4)*10 +(ReadValue&0x0F);
        ReadValue = Read1302(DS1302_WEEK);
        Time->Week =((ReadValue&0x70)>>4)*10 + (ReadValue&0x0F);
        ReadValue = Read1302(DS1302_MONTH);
        Time->Month = ((ReadValue&0x70)>>4)*10 +(ReadValue&0x0F);
        ReadValue = Read1302(DS1302_YEAR);
```

```
        Time->Year = ((ReadValue&0x70)>>4)*10 +(ReadValue&0x0F);
}

void DateToStr (SYSTEMTIME* Time)
{
        //将十进制数转换为液晶显示的 ASCII  值，即变为字符型，此函数为年月日信息
        Time->DateString[0]=Time->Year/10 +'0';
        Time->DateString[1]=Time->Year%10 +'0';
        Time->DateString[2]='-';
        Time->DateString[3]=Time->Month/10 +'0';
        Time->DateString[4]=Time->Month%10 +'0';
        Time->DateString[5]='-';
        Time->DateString[6]=Time->Day/10 +'0';
        Time->DateString[7]=Time->Day%10 +'0';
        Time->DateString[8]='\0';
}

void TimeToStr(SYSTEMTIME* Time)
{
        //将十进制数转换为液晶显示的 ASCII 值，此处为时间信息
        Time->TimeString[0]=Time->Hour/10 +'0';
        Time->TimeString[1]=Time->Hour%10 +'0';
        Time->TimeString[2]=':';
        Time->TimeString[3]=Time->Minute/10 + '0';
        Time->TimeString[4]=Time->Minute%10+'0';
        Time->TimeString[5]=':';
        Time->TimeString[6]=Time->Second/10+ '0';
        Time->TimeString[7]=Time->Second%10 +'0';
        Time->DateString[8]='\0';
}

void Initial_DS1302 (void)
{
        unsigned char Second;
        Second=Read1302(DS1302_SECOND);
        if(Second&0x80)//初始化时间(
                DS1302_SetTime(DS1302_SECOND,0);
        DS1302_SetTime(DS1302_MINUTE,0);
        DS1302_SetTime(DS1302_YEAR,21);
        DS1302_SetTime(DS1302_MONTH,12);
        DS1302_SetTime(DS1302_DAY,17);
}
```

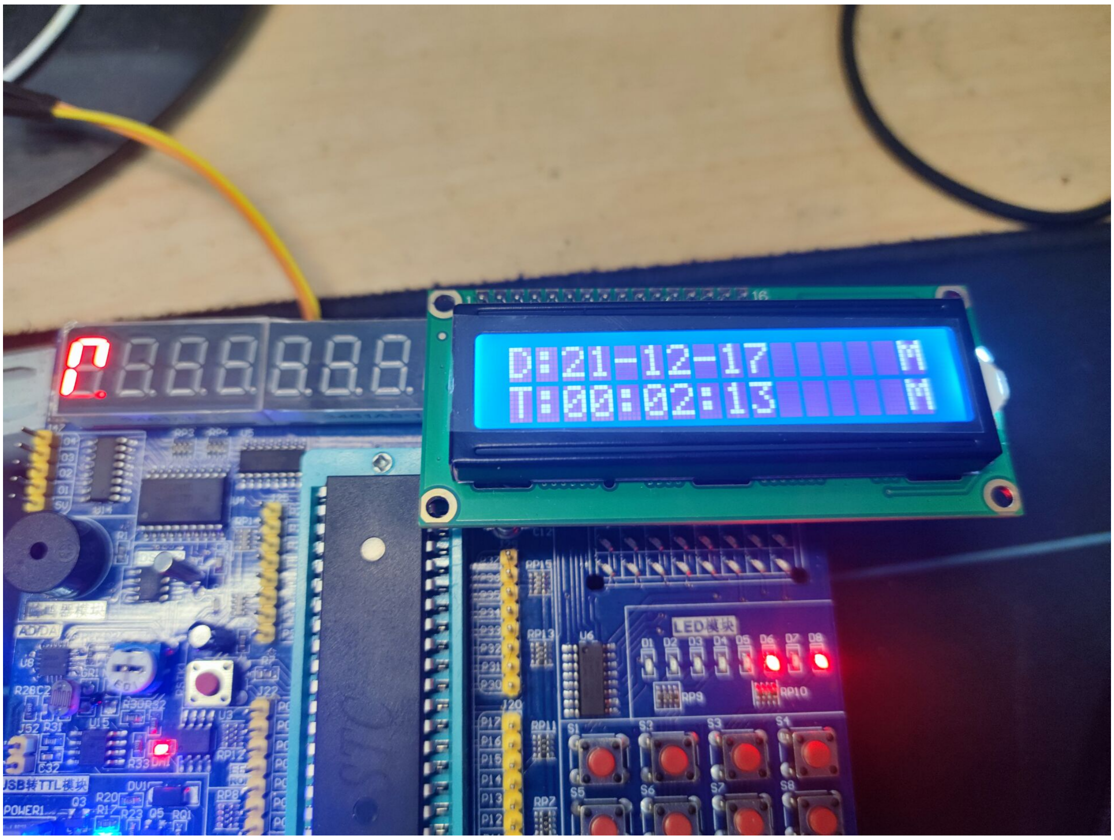
LCD1602.h

```
#ifndef LCD_CHAR_1602_2005_4_9
#define LCD_CHAR_1602_2005_4_9
#define uchar unsigned char
#define uint unsigned int

sbit lcdrs = P2^6;
sbit lcdrw = P2^5;
sbit lcden = P2^7;

void delay (uint z)
{
	uint x,y;
	for(x=z;x>0 ; x--)
	for(y=110; y>0;y--);
}
void write_com(uchar com)
{
	lcdrw=0;
	lcdrs=0;
	P0=com;
	delay(5);
	lcden=1;
	delay(5);
	lcden=0;
}
void write_data(uchar date)
{
	lcdrw=0;
	lcdrs=1;
	P0=date;
	delay(5);
	lcden=1;
	delay(5);
	lcden=0;
}
void init1602()
{
	lcdrw=0;
	lcden=0;
	write_com(0x3C);
	write_com(0x0C);
	write_com(0x06);
	write_com(0x01);
```

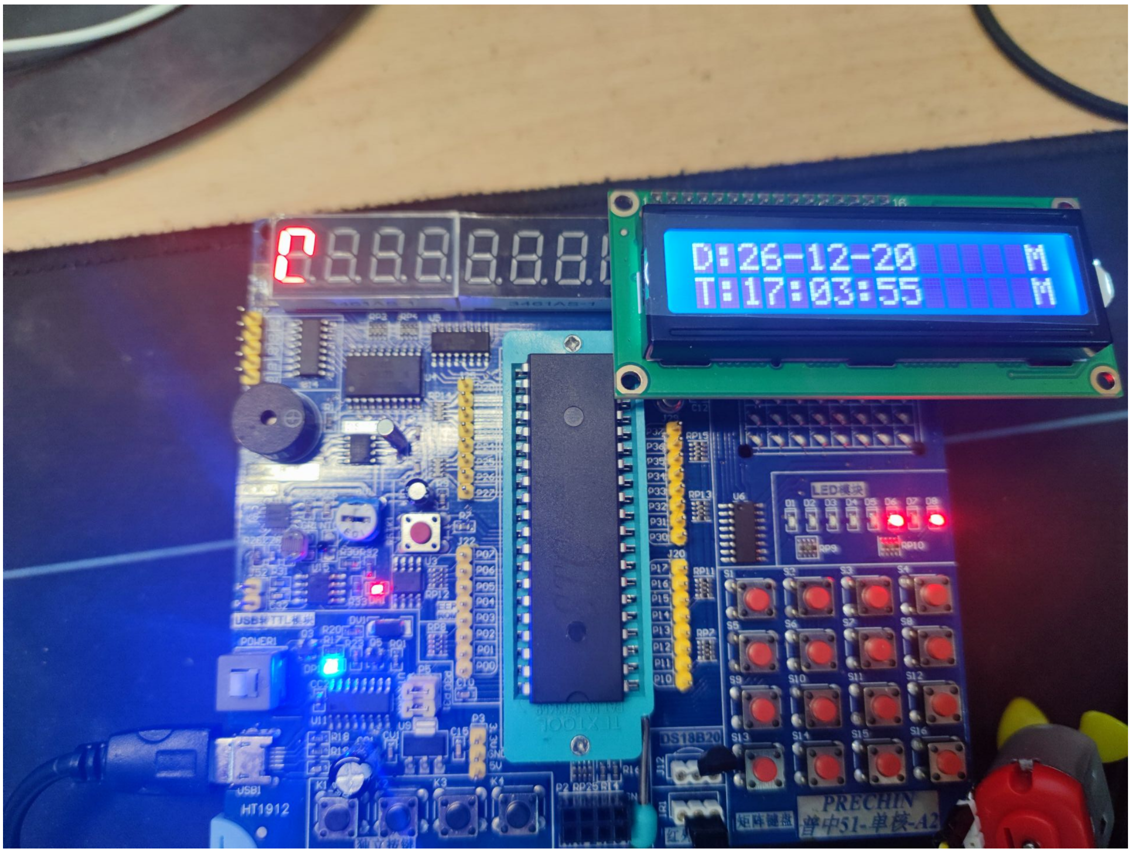
```
    write_com(0x80);
}

void write_string(uchar *pp, uint n)
{
    int i;
    for(i=0; i<n; i++)
    {
        write_data(pp[i]);
    }
}
#endif
```

二、实现效果

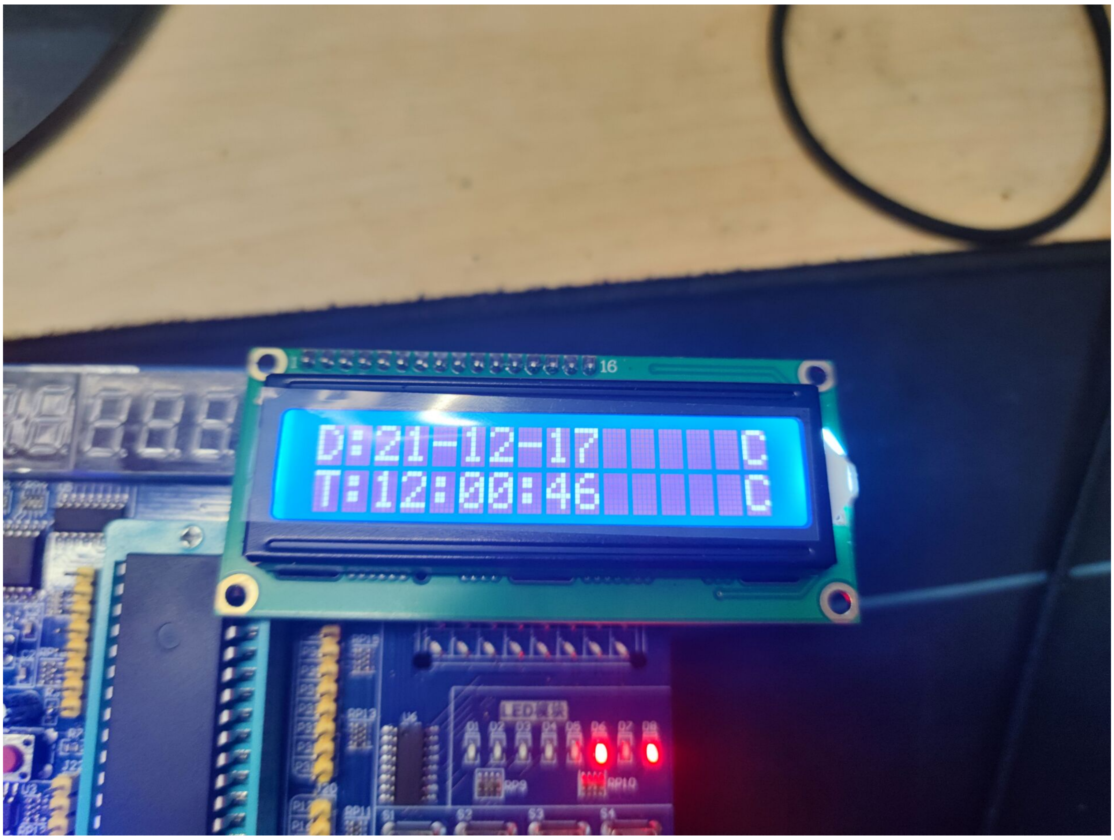
显示日期和时间



修改月份



```
D:26-12-20      M
T:17:03:55      M
```



```
D:21-12-17      C
T:12:00:46      C
```