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MICROCONTROLLER AND MICROPROCESSOR LAB

EXPERIMENT 10 - B

AIM: Write an embedded C program to display a digital clock showing "HH:MM: SS" on the first line and the actual time on the second line of a 16×2 LCD interface to an 8051-microcontroller hardware kit.

SOFTWARE USED: Keil uVision5

CODE:

```
#include<reg51.h>
#define lsb 0xFD
#define msb 0x4B

sbit RS=P2^7;
sbit RWB=P2^6;
sbit EN=P2^5;
sbit BUSY=P0^7;
unsigned char msg1[16]={"HH:MM:SS"};
unsigned char disp_data[8]=0;

void lcd_cmd(unsigned char);
void lcd_data(unsigned char);
void lcd_busy(void);
void lcd_initialize(void);
void t0isr(void);
void display_clock(void);

bit bdata secflg=0;
unsigned char i,j,cnt=0,sec=0,min=0,hr=0;

void main(void)
{ int i;
        TMOD=0X01;
        TL0=lsb;
        TH0=msb;
        EA=1;
        ET0=1;
        EN=0;
        lcd_initialize();
        lcd_cmd(0x80);
        for(i=0;i<8;i++)
        {
                lcd_data(msg1[i]);
        }
        lcd_cmd(0xc0);
```

```
	for(i=0;i<8;i++)
	{
		if(i==2|i==5)
			lcd_data(':');
		else
			lcd_data(disp_data[i]+'0');
	}
	TR0=1;
	while(1)
	{
		if(secflg==1)
		{
			secflg=0;
			sec++;
			if(sec==60)
			{
				sec=0;
				min++;
				if(min==60)
				{
					min=0;
					hr++;
					if(hr==24)
						hr=0;
					disp_data[0]=hr/10;
					disp_data[1]=hr%10;
				}
				disp_data[3]=min/10;
				disp_data[4]=min%10;
			}
			disp_data[6]=sec/10;
			disp_data[7]=sec%10;
			display_clock();
		}
	}
}

void lcd_cmd(unsigned char temp)
{
	lcd_busy();
	RS=0;
	RWB=0;
	P0=temp;
	EN=1;
	EN=0;
	return;
```

```
}

void lcd_data(unsigned char temp)
{
	lcd_busy();
	RS=1;
	RWB=0;
	P0=temp;
	EN=1;
	EN=0;
	return;
}

void lcd_busy(void)
{
	BUSY=1;
	RS=0;
	RWB=1;
	EN=1;
	EN=0;
	while(BUSY==1)
	{
		EN=0;
		EN=1;
	}
	EN=0;
	return;
}

void lcd_initialize(void)
{
	lcd_cmd(0X3C);
	lcd_cmd(0X06);
	lcd_cmd(0X0E);
	lcd_cmd(0X01);
	return;
}

void t0isr(void) interrupt 1
{
	TL0=lsb;
	TH0=msb;
	cnt++;
	if(cnt==20)
	{
		cnt=0;
```

```
                secflg=1;
        }
        return;
}

void display_clock(void)
{ int i;
        lcd_cmd(0xc0);
        for(i=0;i<8;i++)
        {
                if(i==2|i==5)
                        lcd_data(':');
                else
                        lcd_data(disp_data[i]+'0');
        }
        return;
}
```

RESULT:

CONCLUSION:

This embedded C program for an 8051 microcontroller displays a digital clock on a 16x2 LCD interface. The clock format "HH:MM:SS" is updated in real-time using interrupts and displays the current time accurately. Ensure hardware setup and LCD connections for proper functionality. Additional features or optimizations can be implemented within hardware constraints.