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//LCD2051V4.c          September 29, 2010
/* This is the code in the 2051/4051 ATMEL processor on
   the SERIAL LCD board
*/
#include<reg51.h>
//
void Initialize();
void WriteLCDCmd(char c);
void WriteLCDData(char c, char Pos);
void ClearDisplay();
void Invalid(unsigned char m);
void Delay (unsigned int tock);
void SerialInt();
const char msgInit[] = "Display ready";
unsigned char buffer[33];
unsigned char bIndex = 0;
//
void main (void)
{int pos;
 unsigned int i;
 Initialize();
 for(pos=0;pos<13;pos++)
   WriteLCDData(msgInit[pos], pos);
 PCON = 0x80;
 TMOD = 0x20;          //Timer 1 mode 2
 TH1 = 0xcc;          //1200 baud at 12 MHz
 //This was changed to make the baud rate 4800
 TCON = 0x40;         //Start the baud clock
 SCON = 0x50;         //Enable receiver
 IE = 0x90;          //Enable the serial interrupt
 Delay(3000);
 ClearDisplay();
 for(i=0;i<32;i++)
   buffer[i] = ' ';
 TI = 0;              //Transmit interrupt off -> receive only
 while(1)
   {for(pos=0;pos<32;pos++)
     WriteLCDData(buffer[pos], pos);
   }
}
//
void Initialize()
{unsigned char i;
 Delay(1);
 P3 = P3 & 0x5F;      //EN and RS = 0
 for(i=0;i<255;i++);
 WriteLCDCmd(0x38);   //Required for initialization
 Delay(1);
 WriteLCDCmd(0x38);   //Required for initialization
 for(i=1;i<255;i++);
 WriteLCDCmd(0x38);   //Required for initialization
 for(i=1;i<255;i++);
 WriteLCDCmd(0x38);   //2 rows x 16 cols 5x7 dot char
 for(i=1;i<255;i++);
 WriteLCDCmd(0x0C);   //Display on, cursor off
 Delay(1);
 WriteLCDCmd(0x01);   //Cursor home
 Delay(1);
 WriteLCDCmd(0x04);   //incr cursor and shift off
 Delay(1);
 return;
}

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}

void WriteLCDData(char c, char Pos)
{unsigned char i;
  if(Pos < 16)
    WriteLDCmd(Pos | 0x80);
  else
    WriteLDCmd((Pos-16) | 0xC0);
  for(i=0;i<10;i++);
  P1 = c;           //Data to LCD Data
  P3 = P3 | 0xA0;   //RS = EN = 1
  Delay(1);
  P3 = P3 &0x7F;   //EN = 0
  return;
}

void WriteLDCmd(char c)
{P1 = c;           //Data to LCD data
  P3 = P3 & 0xDF;   //RS = 0
  P3 = P3 | 0x80;   //En = 1
  Delay(1);        //Delay
  P3 = P3 & 0x7F;   //En = 0
  return;
}
//
void ClearDisplay()
{unsigned char i;
  WriteLDCmd(0x01); // clear display
  for(i=0;i<32;i++) // clear buffer
    buffer[i] = ' ';
}
//
void SerialInt() interrupt 4 using 1
{unsigned char c;
  c = SBUF & 0x7F;
  if(c == '/')      // front slash clears display and resets index
    {ClearDisplay();
     bIndex = 0;
    }
  else
    {buffer[bIndex] = c;
     bIndex = (bIndex + 1) % 32;
    }
  RI = 0;           //Turn off receive interrupt flag
}

void Delay (unsigned int tock)
{unsigned int tick,t;
  for(tick=0;tick<tock;tick++)
    {for(t=0;t<255;t++);
    }
}

```