CENG482 Embedded Systems Final Project

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Final Project

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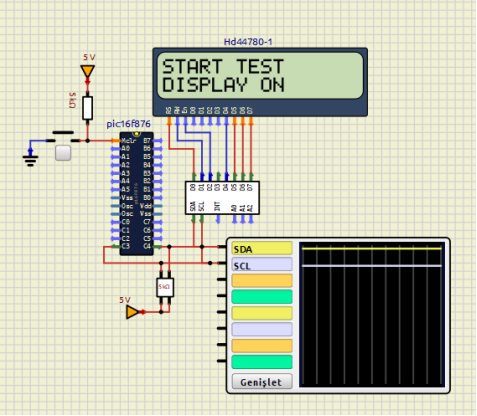
SOLUTİON 5. EXAMPLE:

Data is sent via I2C.

When data is sent to the screen, Scl creates a clock. Accordingly, the data to be sent is sent over the SDA line, byte by byte.



SOLUTİON 6. EXAMPLE:

bcf SYSLCDTEMP,1;

bcf is "bit clear f".

This sets bit 1 of the register SYSLCDTEMP off.

movlw 1;

movlw is "move literal value to WREG".

It loads a 1 into the WREG.

movwf LCDBYTE;

movwf is "move WREG to f".

It moves the content of WREG to the register LCDBYTE.

call LCDNORMALWRITEBYTE;

call stands for "call subroutine".

This calls the subroutine at the address labeled LCDNORMALWRITEBYTE.

movlw 4;

This command loads 4 into the WREG.

movwf SysWaitTempMS;

This moves the content of WREG into the register SysWaitTempMS.

clrf SysWaitTempMS_H;

clrf is "clear f".

This clears the register SysWaitTempMS_H, meaning that it sets it to 0.

call Delay_MS;

It calls the subroutine at the address labeled Delay_MS.

movlw 128;

This loads the value 128 into WREG.

movwf LCDBYTE;

This moves the content of WREG into the register LCDBYTE.

call LCDNORMALWRITEBYTE;

This calls the subroutine at the address labeled LCDNORMALWRITEBYTE.

movlw 66;

This loads the value 66 into the WREG.

movwf DELAYTEMP;

It moves the content of WREG to the register DELAYTEMP.

DelayUS1 decfsz DELAYTEMP,F;

“decfsz” stands for "decrement f, skip if zero".

It decrements the value in DELAYTEMP and, if it results in zero, the next instruction is skipped.

goto DelayUS1;

goto stands for "go to".

It causes a jump to the address labeled DelayUS1.

nop;

nop stands for "no operation".

This performs nothing for one instruction cycle.

return;
It returns from the subroutine.

Putting it all together to understand what the code does:
• Clears bit 1 of the SYSLCDTEMP register.
• Sets the LCDBYTE to 1 and calls a subroutine to write this byte to the LCD.
• Loads a delay value of 4 milliseconds into the SysWaitTempMS register and clears SysWaitTempMS_H, then calls a delay subroutine to wait this long.
Sets the LCDBYTE register to 128 and calls the subroutine to write this byte to the LCD.
Loads a delay value of 66 into DELAYTEMP and enters a loop, which decrements this value for an effective delay, then returns from the subroutine.
In a nutshell, the code seems to initialize the LCD, do some delay operations, and then write specific bytes into the LCD, namely 1 and 128. It is not detailed here, but the subroutines, LCDNORMALWRITEBYTE and Delay_MS, most probably handle the low-level operations for writing to the LCD and implement the delays, respectively.

SOLUTİON OF 7. EXAMPLE:

I2C is a synchronous, multi-master, multi-slave serial communication protocol; it is a low-speed peripheral to connect processors and microcontrollers in an embedded system. It was developed by Philips Semiconductor, now NXP Semiconductors, in the 1980s and operates on just two wires: one for a serial data line and the other for a serial clock line. These lines transmit data between devices so that communication is enabled without the need for multiple direct connections, making the design simpler and needing fewer pins on the microcontroller. Real-life examples include: a microcontroller communicating with a temperature sensor in a smart thermostat or the interface between a microcontroller and an OLED display in a smartwatch.