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Interfacing LCD with PIC microcontroller | MPLAB Projects

this post shows how to interface PIC16F887 microcontroller with 16×2 LCD screen (with HD44780 controller), the compiler used in this example is [Microchip](#) MPLAB XC8 (MPLAB X IDE with MPLAB XC8 compiler).

The 16×2 LCD screen has 2 rows and 16 columns which means we can write up to 32 character. There are other screens with the HD44780 controller such as: 16×1, 20×4 ...

Hardware Required:

- PIC16F887 microcontroller
- 1602 (16×2) or 2004 (20×4) or any LCD compatible with HD44780 controller
- 10k ohm variable resistor or potentiometer
- 330 ohm resistor
- 5V Power source
- Breadboard

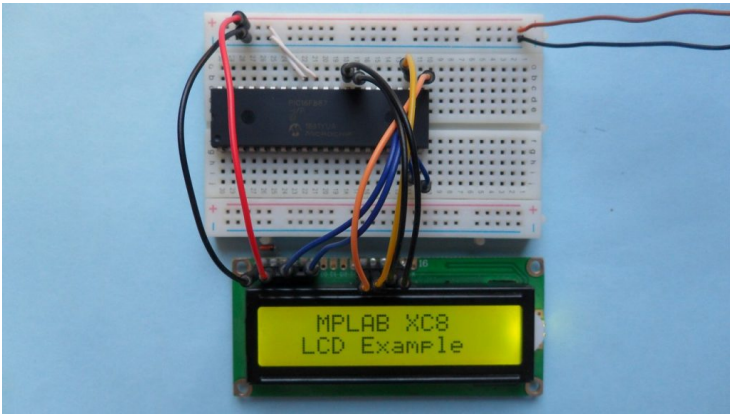


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- DHT11 DHT22
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- DS3231 GPS
- HC-SR04
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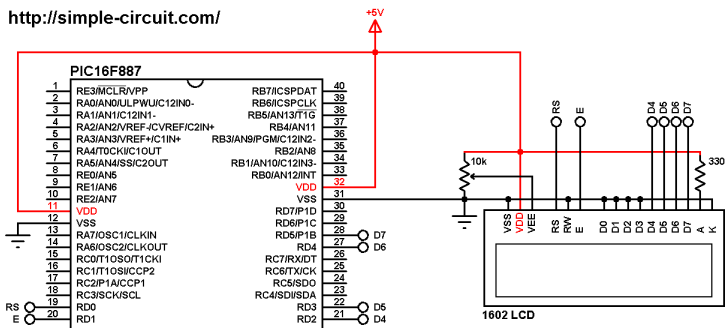


- Jumper wires



Interfacing LCD with PIC
microcontroller circuit:

Example circuit schematic diagram is shown
below.



(All grounded terminal are connected together)

The 16×2 LCD screen is connected to the
PIC16F887 microcontroller as follows:

RS → RD0 pin

E → RD1 pin

D4 → RD2 pin

D5 → RD3 pin

D6 → RD4 pin

D7 → RD5 pin

VSS, RW, D0, D1, D2, D3 and K are connected
to circuit GND (ground)

VEE to the variable resistor (or potentiometer)
output pin

VDD to +5V and A to +5V through 330 ohm
resistor

VEE pin is used to control the contrast of the
LCD. A (anode) and K (cathode) are the back

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light LED pins.

In this project the PIC16F887 microcontroller runs with its internal oscillator @ 8 MHz, MCLR pin is configured as an input pin.

Interfacing LCD with PIC microcontroller C code:

The C code below is for MPLAB XC8 compiler, it was tested with version 2.00 installed on MPLAB X IDE version 5.05

To be able to compile the C code, a small LCD library for MPLAB XC8 compiler is required which can be downloaded from the following link:

[MPLAB XC8 LCD Library](#)

after the download, add the library file (LCD_Lib.c) to project folder.

MPLAB LCD library user functions:


```
LCD_Begin(); // must be called before any other function, it initializes the LCD module.
LCD_Goto(uint8_t col, uint8_t row); // set write position on LCD (upper left is 1, 1 and second row first position is 1, 2)
LCD_PutC(char LCD_Char); // prints a character (LCD_Char) on the LCD
LCD_Print(char* LCD_Str); // prints a string (LCD_Str) on the LCD
LCD_Cmd(uint8_t Command); // send a command to the LCD
```

The following commands can be used with LCD_Com function (example: LCD_Com(LCD_CLEAR);):

Command	Description
LCD_FIRST_ROW	Move cursor to the 1st row

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LCD_SECOND_ROW	Move cursor to the 2nd row
LCD_THIRD_ROW	Move cursor to the 3rd row
LCD_FOURTH_ROW	Move cursor to the 4th row
LCD_CLEAR	Clear display
LCD_RETURN_HOME	Return cursor to home position, returns a shifted cursor to its original position. Display data RAM is unaffected
LCD_CURSOR_OFF	Turn off cursor
LCD_UNDERLINE_ON	Underline cursor on
LCD_BLINK_CURSOR_ON	Blink cursor on
LCD_MOVE_CURSOR_LEFT	Move cursor left without changing display data RAM
LCD_MOVE_CURSOR_RIGHT	Move cursor right without changing display data RAM
LCD_TURN_ON	Turn Lcd display on
LCD_TURN_OFF	Turn Lcd display off
LCD_SHIFT_LEFT	Shift display left without changing display data RAM
LCD_SHIFT_RIGHT	Shift display right without changing display data RAM

The connection between the PIC microcontroller and the LCD module is defined as follows (example):

```
1 //LCD module connections
2 #define LCD_RS      RD0
3 #define LCD_EN      RD1
4 #define LCD_D4      RD2
5 #define LCD_D5      RD3
6 #define LCD_D6      RD4
7 #define LCD_D7      RD5
8 #define LCD_RS_DIR  TRISD0
9 #define LCD_EN_DIR  TRISD1
10 #define LCD_D4_DIR  TRISD2
11 #define LCD_D5_DIR  TRISD3
12 #define LCD_D6_DIR  TRISD4
```

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```
13 #define LCD_D7_DIR    TRISD5
14 //End LCD module connections
```

Interfacing LCD with PIC microcontroller

MPLAB XC8 code:

The microcontroller used in this example is PIC16F887, configuration words are:

```
1 #pragma config CONFIG1 = 0x2CD4
2 #pragma config CONFIG2 = 0x0700
```

Where:

- In-Circuit Debugger disabled
- Low voltage programming disabled
- Fail-Safe Clock Monitor enabled
- Internal/External Switchover mode enabled
- Brown-out Reset (BOR) disabled
- Data memory code protection disabled
- Program memory code protection disabled
- RE3/MCLR pin function is digital input, MCLR internally tied to VDD
- Power-up Timer (PWRT) disabled
- Watchdog Timer (WDT) disabled
- INTOSCIO oscillator: I/O function on RA6/OSC2/CLKOUT pin, I/O function on RA7/OSC1/CLKIN
- Flash Program Memory Self Write disabled
- Brown-out Reset set to 4.0V

```
1 /*
2  * Interfacing PIC16F887 microcontroller
3  * C Code for MPLAB XC8 compiler
4  * Internal oscillator used @ 8MHz
5  * This is a free software with NO WARRANTY
6  * https://simple-circuit.com/
7  */
8
9
10 #pragma config CONFIG1 = 0x2CD4
11 #pragma config CONFIG2 = 0x0700
12
13 //LCD module connections
14 #define LCD_RS        RD0
15 #define LCD_EN        RD1
16 #define LCD_D4        RD2
```

```
17 #define LCD_D5      RD3
18 #define LCD_D6      RD4
19 #define LCD_D7      RD5
20 #define LCD_RS_DIR   TRISD0
21 #define LCD_EN_DIR   TRISD1
22 #define LCD_D4_DIR   TRISD2
23 #define LCD_D5_DIR   TRISD3
24 #define LCD_D6_DIR   TRISD4
25 #define LCD_D7_DIR   TRISD5
26 //End LCD module connections
27
```

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