

**Universidade Federal de Alagoas**

## Microcontroladores

We're using LM016L, a 16x2 LC display. Here is the pinout from it

PIN N°	SIMBOLO	DESCRIPCION
1	Vss	Tierra de alimentación GND
2	Vdd	Alimentación de +5V CC
3	Vo	Contraste del cristal liquido. ( 0 a +5V )
4	RS	Selección del registro de control/registro de datos: RS=0 Selección registro de control RS=1 Selección registro de datos
5	R/W	Señal de lectura/escritura: R/W=0 Escritura (Write) R/W=1 Lectura (Read)
6	E	Habilitación del modulo: E=0 Módulo desconectado E=1 Módulo conectado
7-14	D0-D7	Bus de datos bidireccional.

**Useful commands:**

No.	Command	Hex value
1	Function Set: 8-bit, 1 Line, 5x7 Dots	0x30
2	Function Set: 8-bit, 2 Line, 5x7 Dots	0x38
3	Function Set: 4-bit, 1 Line, 5x7 Dots	0x20
4	Function Set: 4-bit, 2 Line, 5x7 Dots	0x28
5	Entry Mode	0x06
6	Display off Cursor off	0x08
7	Display on Cursor on	0x0E
8	Display on Cursor off	0x0C
9	Display on Cursor blinking	0x0F
10	Shift entire display left	0x18
11	Shift entire display right	0x1C
12	Move cursor left by one character	0x10
13	Move cursor right by one character	0x14

It works with ASCII table for sending character data information. Some more useful commands are:

0C Turns ON JUST the LCD, no cursor

08 Turns OFF the LCD display

0E Turns on the LCD display and Sets a SOLID CURSOR

0F Turns on the LCD display and Sets a BLINKING CURSOR

80 Moves cursor to first address on the left of LINE 1

C0 Moves cursor to first address on the left of LINE 2

Initialization sequence ( **each command must be split into two nibbles: first send most significant, then send least significant** ):

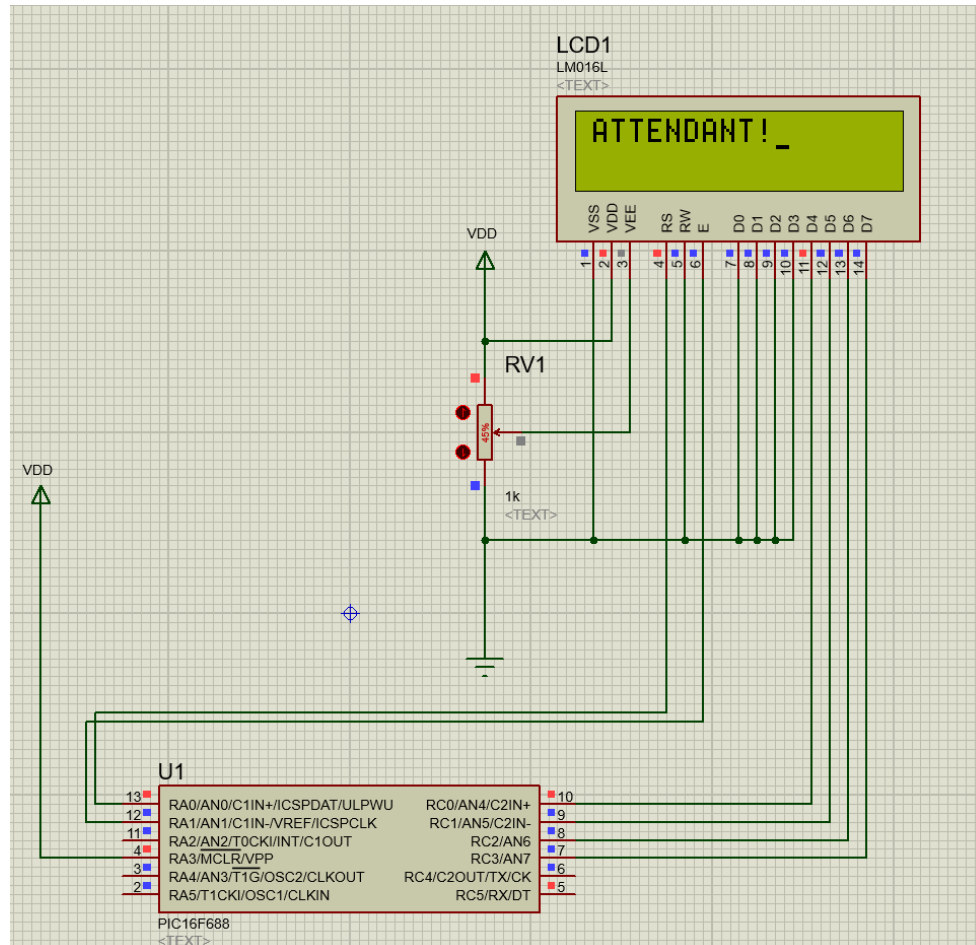
H'33' ; Init command

H'32' ; Init command

H'28' ; 4 bit mode

H'0F' ; Display blinking on cursor

**Scheme example:**



References:

[Rickey's World. LCD Interfacing Tutorial: LCD 4-bit Mode Programming](#) shows C and Assembly implementations

[Learning MSP430. 16x2 LCD Interfacing in 4 bit mode](#) shows a C implementation and teach some basics about the process.

[EmbeddedCraft. Liquid Crystal Display LCD 4-Bit operation](#) shows even a circuit scheme and a flow chart explaining detailed the theory used.

[Explaining video about LCD disply](#) shows how to initiate LCD withou microcontroller. Can be useful.

ExProgramacion YouTube Channel. <https://www.youtube.com/watch?v=7Ru6sKDsz1E>.

Luiz Claudio Youtube Channel: [https://www.youtube.com/watch?v=1\\_nVScZG0J4](https://www.youtube.com/watch?v=1_nVScZG0J4).