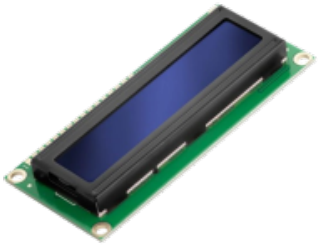
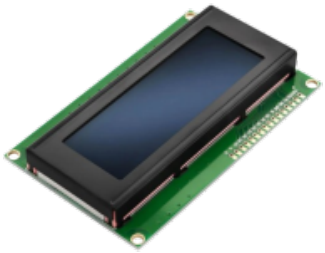
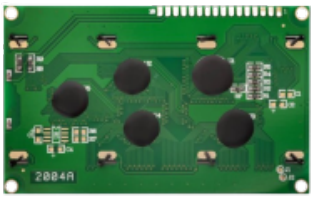
lamaPLC: LCD 1602/2004 with I²C communication

The HD44780 chip-based 1602/2004 LCD module is bright and high-contrast, thanks to its LCD technology, which features a blue-green background. This display is well-suited to your projects if you need a screen with a wide viewing angle, a compact design, and low power consumption. The LCD 1602 can display 16 characters in two rows, while the LCD 2004 can display 20 characters in four rows. Additionally, 1602/2004 displays can be easily connected using an I²C adapter.

			
LCD 1602 Front Side 16 charachers 2 rows	LCD 1602 Back Side 16 charachers 2 rows	LCD 2004 Front Side 20 charachers 4 rows	LCD 2004 Back Side 20 charachers 4 rows

Features

- Display Mode: STN, BLUB
- Display Format: 16 Characters x 2 Lines
- Viewing Direction: 6 O'clock
- Input Data: 4-Bit or 8-Bit interface available
- Display Font: 5 x 8 Dots
- Power Supply: Single Power Supply (**5V±10%**)
- Driving Scheme: 1/16 Duty, 1/5 Bias
- Backlight (side): white LED

interfaces

Pin	symbol	description	function
1	Vss	GROUND	0V (GND)
2	Vcc	POWER SUPPLY FOR LOGIC CIRCUIT	+5V
3	VEE	LCD CONTRAST ADJUSTMENT	
4	RS	INSTRUCTION/DATA REGISTER SELECTION	RS = 0 : INSTRUCTION REGISTER RS = 1 : DATA REGISTER
5	R/W	READ/WRITE SELECTION	R/W = 0 : REGISTER WRITE R/W = 1 : REGISTER READ
6	E	ENABLE SIGNAL	
7	DB0	DATA INPUT/OUTPUT LINES	8 BIT: DB0-DB7
8	DB1	DATA INPUT/OUTPUT LINES	8 BIT: DB0-DB7
9	DB2	DATA INPUT/OUTPUT LINES	8 BIT: DB0-DB7
10	DB3	DATA INPUT/OUTPUT LINES	8 BIT: DB0-DB7

Pin	symbol	description	function
11	DB4	DATA INPUT/OUTPUT LINES	8 BIT: DB0-DB7
12	DB5	DATA INPUT/OUTPUT LINES	8 BIT: DB0-DB7
13	DB6	DATA INPUT/OUTPUT LINES	8 BIT: DB0-DB7
14	DB7	DATA INPUT/OUTPUT LINES	8 BIT: DB0-DB7
15	LED+	SUPPLY VOLTAGE FOR LED+	+5V
16	LED-	SUPPLY VOLTAGE FOR LED-	0V

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Font set

The LCD1602 employs the Hitachi HD44780 LCD controller chip. This chip features a built-in font and supports the definition of up to 8 custom characters.

There are two variants of the chip's ROM, each with different fonts: HD44780UA00, which contains Japanese katakana characters, and HD44780UA02, featuring Western European characters.

I²C adapter

Reduction of the pin count for controlling an LCD from 12 to 2 pins:
This practical module enables fast data transfer and converts the serial data output of an LCD into an I²C signal. It uses only four pins instead of 16 and supports six selectable I²C addresses, enabling simultaneous operation of up to 6 displays.

The I²C address for the 1602 and 2004 LCD modules depends on the specific I/O expander chip used on the I²C backpack (usually a **PCF8574**).

Common Default Addresses

- **0x27:** The most common default address for modules using the **PCF8574T** chip.
- **0x3F:** The common default address for modules using the **PCF8574AT** chip.

Address Ranges by Chip Type

The address is determined by the state of three hardware pins (A0, A1, A2) on the backpack.

- **PCF8574 / PCF8574T:** Range is 0x20 to 0x27
- **PCF8574A / PCF8574AT:** Range is 0x38 to 0x3F

How to Change the Address

Most I²C backpacks have three sets of solder pads labeled A0, A1, and A2.

- **Default State:** Usually, these pads are “open” (high), resulting in the default address (0x27 or 0x3F).
- **Changing Address:** Shorting (soldering) a pad connects that address bit to ground (low), changing the address.

Configuration Table (for PCF8574)

- All Open: 0x27
- A0 Shorted: 0x26
- A1 Shorted: 0x25
- A2 Shorted: 0x23
- All Shorted: 0x20

Arduino example

Connect the 4 pins of the I²C backpack to your Arduino as follows:

- GND to GND.
- VCC to 5V.
- SDA to A4 (on Uno/Nano) or the dedicated SDA pin.
- SCL to A5 (on Uno/Nano) or the dedicated SCL pin.

Library Installation

Open the Arduino IDE, go to Sketch > Include Library > Manage Libraries, and search for and install “LiquidCrystal I2C” (by Frank de Brabander or Marco Schwartz).

This sketch works for both 1602 and 2004 displays. Ensure you update the 0x27 address and the 16, 2 dimensions if necessary:

```
#include <Wire.h>
#include <LiquidCrystal_I2C.h>

// Set the LCD address to 0x27 for a 16 chars and 2 line display
// Change to (0x3F, 20, 4) for a 2004 display if 0x27 doesn't work
LiquidCrystal_I2C lcd(0x27, 16, 2);

void setup() {
  lcd.init();          // Initialize the LCD
  lcd.backlight();     // Turn on the backlight

  lcd.setCursor(0, 0); // Move cursor to column 0, row 0
  lcd.print("Hello, Arduino!");

  lcd.setCursor(0, 1); // Move to second row
  lcd.print("I2C LCD Example");
}

void loop() {
  // Add dynamic content here if needed
}
```

display topics on lamaPLC

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• lamaPLC: HT16K33 display controller	2026/04/23 21:51	i2c, 7-segment display, display, ht16k33, arduino
• lamaPLC: LCD 1602/2004 with I²C communication	2026/02/14 18:27	communication, i2c, display, lcd, 1602, 2004, hd44780, pcf8574, pcf8574t, pcf8574at, arduino
• lamaPLC: TM1637 7-segment display	2026/02/14 18:26	i2c, 7-segment display, display, tm1637, arduino
• lamaPLC: TM1650 7-Segment Display with I²C like or Modbus Communication	2026/02/14 18:26	tm1650, stc8g, tp8485e, hyuduo5x1b64edtk1244, 7-segment, display, modbus, rtu, modbus rtu, arduino
• SSH1106/SSD1306 OLED Display with I²C communication	2026/02/14 18:27	i2c, oled, display, ssd1306, sh1106, ssh1106, arduino, cmos

communication, I2C, display, LCD, 1602, 2004, HD44780, PCF8574, PCF8574T, PCF8574AT, Arduino