

Iontophoresis Device

The following components were used to make this prototype:

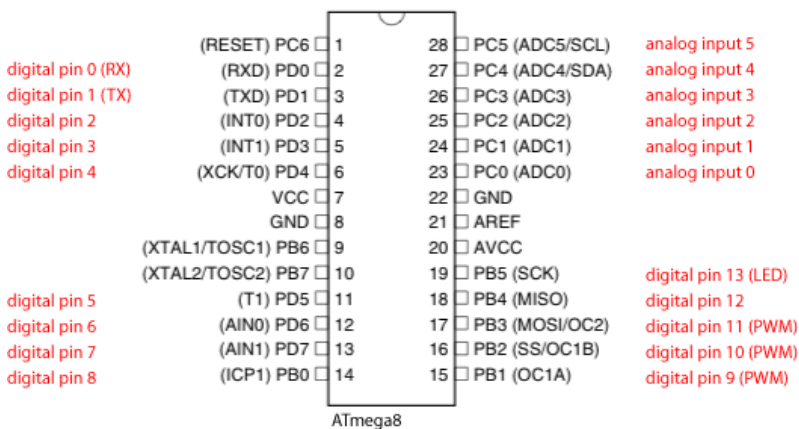
1. ATmega 328P-PU
2. 16MHz Crystal oscillator
3. LM 741 OpAmp
4. BC 547 transistor
5. 1602 LCD Display
6. Push buttons - 6
7. 10K potentiometer
8. 100uF capacitors - 3
9. 22pF capacitor – 2
10. 1K resistors – 4
11. 220 ohm resistor

Now the schematic of the device can be divided into 2 parts: 1. The LCD display and Arduino and 2. The OpAmp circuit.

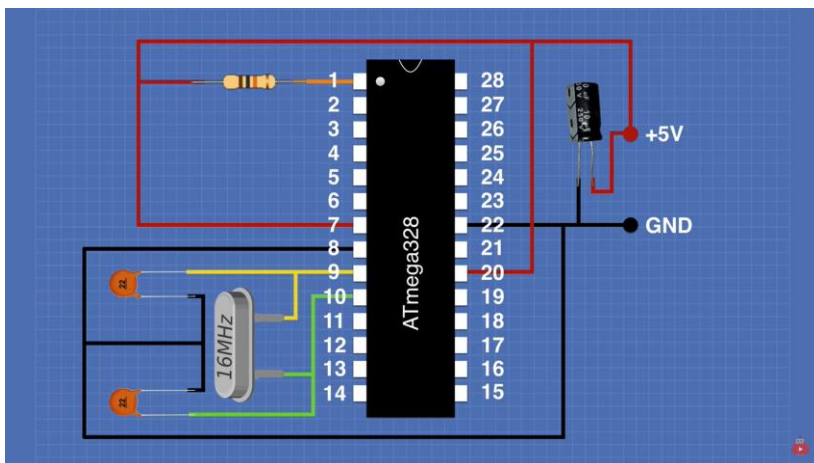
LCD Display and ATmega328P-PU connections:

Arduino Pin Mapping

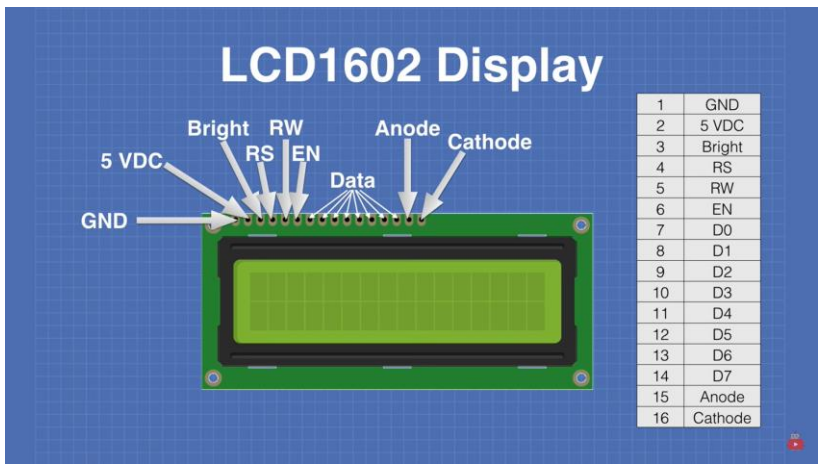
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The following connections should be made with the ATmega 328P-PU to use it:



Below is an image of the schematic of a 1602 display:



Connect pin 1 and 2 of the LCD to ground and 5V respectively. Connect pin 3 to a 10K Potentiometer that is connected between GND and 5V power supply. Pin 5 (RW) and Pin 15 (Cathode) are connected to the ground.

Make the following connections between the LCD Display and ATmega IC:

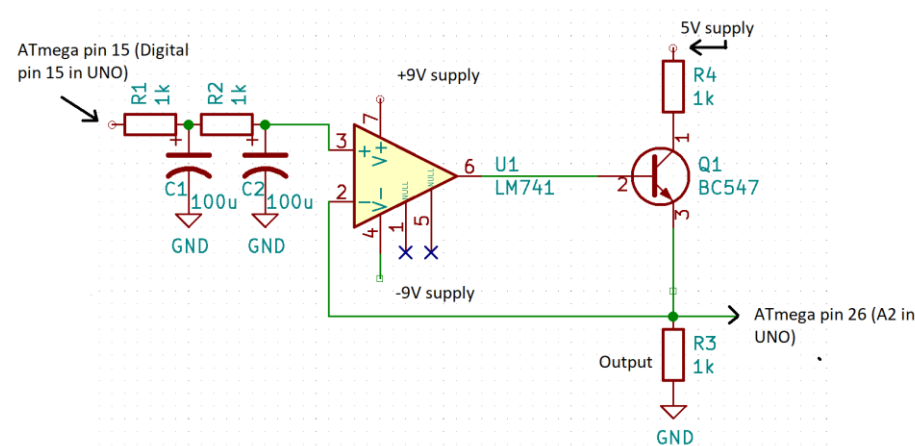
LCD 1602 Display pin number	ATmega 328P-PU pin number
4 (RS)	28 (A5 in UNO)
6 (EN)	5 (Digital 3 in UNO)
11 (D4)	6 (Digital 4 in UNO)
12 (D5)	11 (Digital 5 in UNO)
13 (D6)	12 (Digital 6 in UNO)
14 (D7)	13 (Digital 7 in UNO)
15 (Anode) through a 220ohm resistor	26 (A3 in UNO)

Connecting the Input push buttons to ATmega 328P-PU:

1. Connect one end of the push buttons to the ground.
2. Connect the buttons as follows:

Function of button	ATmega 328P-PU pin number
Increase Current	23 (A0 in UNO)
Decrease Current	18 (Digital 12 in UNO)
Increase Output Time	17 (Digital 11 in UNO)
Decrease Output Time	16 (Digital 10 in UNO)
Start/Stop Output	14 (Digital 8 in UNO)
Start Device	4 (Digital 2 in UNO)

OpAmp circuit and ATmega328P-PU connections:



Power Supply:

Using two 9V batteries and IC 7805 with capacitors for stable output of 5V for the LCD and ATmega chip.

How it works:

The device goes to low power mode after 15 seconds of being unused/inactive. To start it, we use the Start Device button. Now, we can select the current output and the time for which it should be output. After selecting the appropriate settings, pressing the start/stop button will start the current output. A timer will run to zero from the designated time in seconds. After it reaches zero, the current output will become zero. A feedback loop ensures that the output is correct and it keeps correcting itself during output. If we want to stop the output at any point, we can press the start/stop button. That makes the output current instantly zero. The low power mode stops the LCD display and makes all buttons except the Start Device button inactive and there will be no output. The code is attached in a different file.