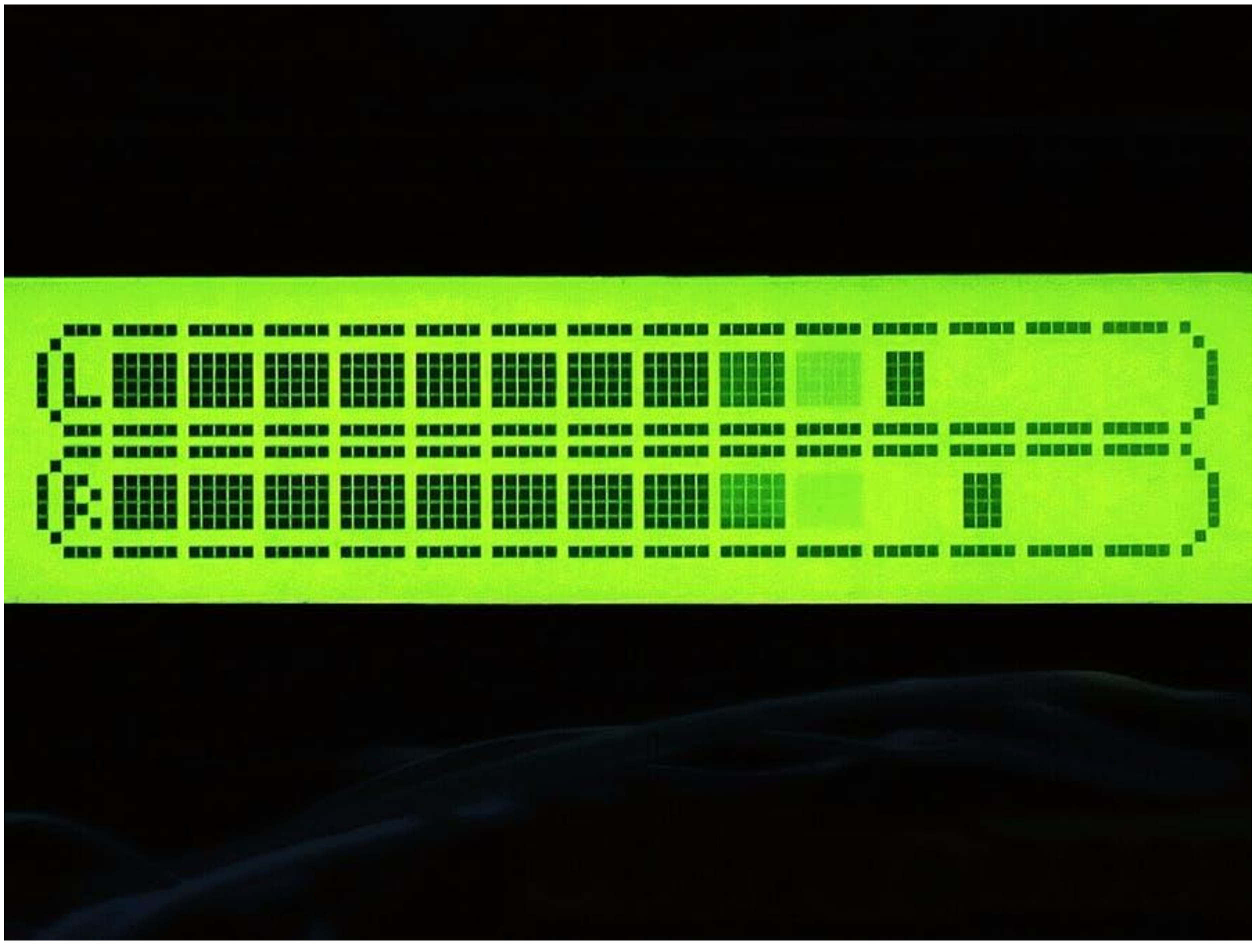


## KTAudio VU Meter © GPL3+

Simple, easy to build 2 x 14 bars stereo VU meter for representing audio level.

## About this project

First of all, this project is aiming to entertain those who like the digital VU (Volume Unit) meters and want to build their own version. The project is easy to build, no deep skills required. However, for better sound vs level visual representation you would need some soldering skills. The input level shifter circuit and DC decouplers are required some attention. Please bear in mind that this device is intended to use this way with low-level audio signals. ( < 2Vrms!)

The only thing you need to create is to create the left and right level shifter circuit and attach it to your Arduino board. Then load the sourcecode and you are almost ready.

Please note that you might need to use separated power supply (separated from your PC) to avoid any kind of ground loop situation with your hifi / pa system! Since Arduino is a sensitive device and lacks of any surge protection, you need to be cautious with ground looping issue.

In the below video you can see it's very simple design: Of course, you can build it with I2C LCD driver as well to reduce the required amount of wires.

**Advantages:**

- Easy to build
- Fairly accurate representation of sound level
- Very good entertaining and for learning purposes
- Can be driven with low level of audio
- It is easy to add / attach to existing PA or HiFi system

**Disadvantages:**

- Linear representation of the volume level (From around -14dB to 0dB)
- Not accurate enough for true representation for studio or usage where accuracy is essential
- High update rate can cause screen flickering
- Low update rate can cause delay in representation

**In the next project I will share another source code that has no disadvantages like this version. ArVUmeter 1.0 will be shared soon...**

https://youtu.be/cswIzjLY0lM

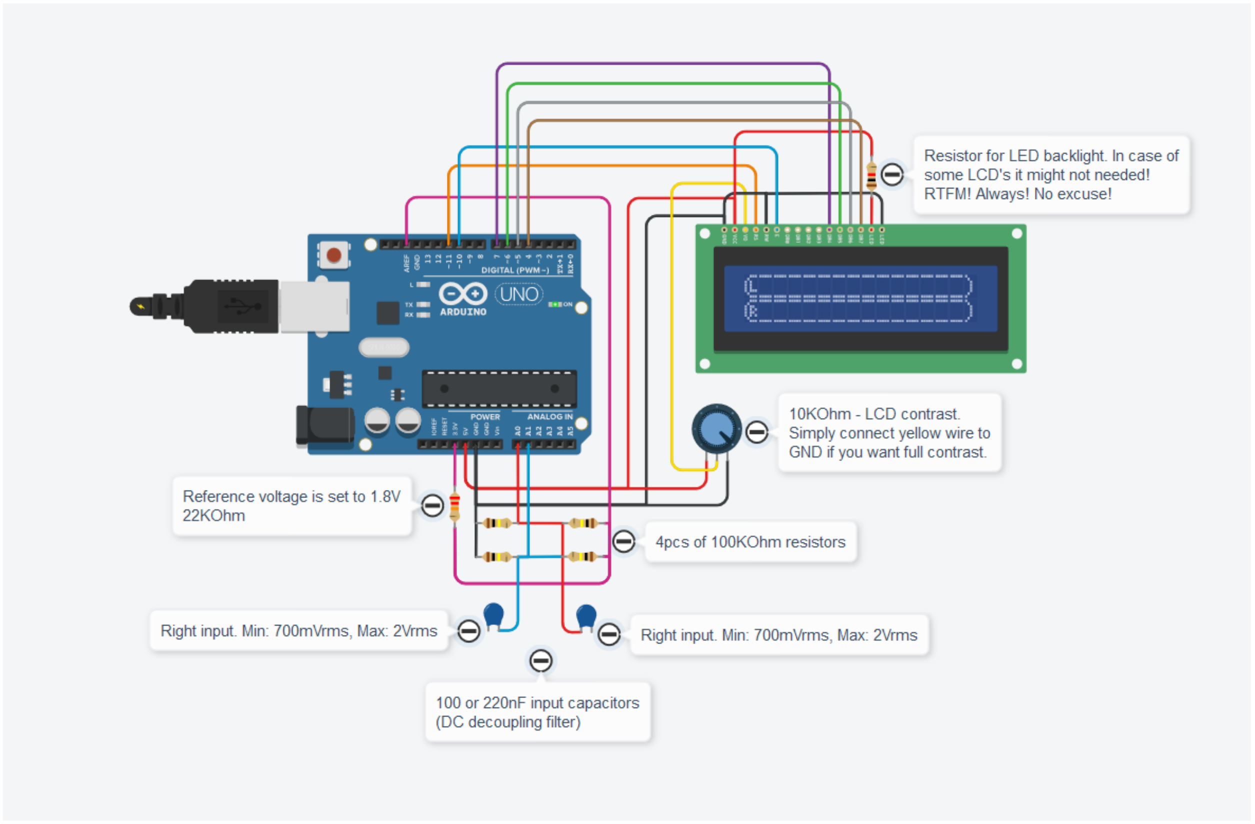
## Code

```
/*
  Arduino based VU meter by KTAudio.
  Developed by ThomAce (Tamas Kamocsai) based on siemenwauters,
theredstonelabz and michiel H's VU meter.

  GNU GPL License v3

  Developer: ThomAce (Tamas Kamocsai)
  Mail: thomacepcg@gmail.com
  Version: 1.0
  Last modification date: 2019.09.24

  Original version:
  https://www.instructables.com/id/ARDUINO-VU-METER/

  Original description:
  VU meter by siemenwauters, theredstonelabz and michiel H don't forget to
like and subscribe to support my work. tnx
*/

#include <LiquidCrystal.h>

byte Bar[8] = {
        B11111,
        B00000,
        B11111,
        B11111,
        B11111,
        B11111,
        B00000,
        B11111
};

byte L[8] = {
        B00111,
        B01000,
        B10100,
        B10100,
        B10100,
        B10111,
        B01000,
        B00111
};

byte R[8] = {
        B00111,
        B01000,
        B10110,
        B10101,
        B10110,
        B10101,
        B01000,
        B00111
};
```

```
byte EndMark[8] = {
        B10000,
        B01000,
        B00100,
        B00100,
        B00100,
        B00100,
        B01000,
        B10000
};

byte EmptyBar[8] = {
        B11111,
        B00000,
        B00000,
        B00000,
        B00000,
        B00000,
        B00000,
        B11111
};

byte peakHoldChar[8] = {
        B11111,
        B00000,
        B01110,
        B01110,
        B01110,
        B01110,
        B00000,
        B11111
};

String main_version = "1.0";
int left, right;                        //Variables to store and calculate
the channel levels
const int numReadings = 5;              //Refresh rate. Lower value = higher
rate. 5 is the defaul
int indexL = 0;                         //Actual channel index
int totalL = 0;                         //Total channel data
int maxL = 0;                           //Maximal level
int indexR = 0;
int totalR = 0;
int maxR = 0;
int inputPinL = A1;                     //Input pin Analog 1 for LEFT channel
int inputPinR = A0;                     //Input pin Analog 0 for RIGHT
channel
int volL = 0;
int volR = 0;
int rightAvg = 0;
int leftAvg = 0;
long peakHoldTime = 1500;               //peak hold time in miliseconds
long peakHold = 0;
int rightPeak = 0;
int leftPeak = 0;
long decayTime = 0;
long actualMillis = 0;

LiquidCrystal lcd(11, 10, 7, 6, 5, 4);  //lcd configuration

void setup()
{
  lcd.begin(40, 2); //Setting up LCD. 16 chars and 2 rows

  lcd.createChar(1, Bar);
  lcd.createChar(2, L);
  lcd.createChar(3, R);
  lcd.createChar(4, EmptyBar);
  lcd.createChar(5, EndMark);
  lcd.createChar(6, peakHoldChar);

  //Showing loading  message and loading bar

  String KTAudio = "KTaudio project";

  for (int i = 0; i <= 16; i++)
  {
    lcd.setCursor(0, 0);
    lcd.print(KTAudio.substring(0, i));
    delay(50);
  }

  KTAudio = "VU meter " + main_version;

  for (int i = 0; i <= KTAudio.length(); i++)
  {
    lcd.setCursor(0, 1);
    lcd.print(KTAudio.substring(0, i));
    delay(50);
  }

  delay(500);

  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Loading...");

  for (int i = 0; i < 16; i++)
  {
    lcd.setCursor(i, 1);
    lcd.write(4);
  }

  for (int i = 0; i < 16; i++)
  {
    lcd.setCursor(i, 1);
    lcd.write(1);

    delay(50);
  }

  delay(500);
  lcd.clear();
  decayTime = millis();
}

void loop()
{
  actualMillis = millis();

  lcd.setCursor(0, 0);         //L channel index
  lcd.write(2);                //L symbol
  lcd.setCursor(0, 1);         //R channel index
  lcd.write(3);                //R symbol
  lcd.setCursor(15, 0);        //closing tag / end mark index 1
  lcd.write(5);                //closing tag / end mark
  lcd.setCursor(15, 1);        //closing tag / end mark index 2
  lcd.write(5);                //closing tag / end mark

  totalL = analogRead(inputPinL) / 4 - 128; //reducing the detected hum and
noise

  if(totalL > maxL)
  {
    maxL = totalL;
  }

  indexL++;

  if (indexL >= numReadings)
  {
    indexL = 0;
    left = maxL;
    maxL = 0;
  }

  totalR = analogRead(inputPinR) / 4 - 128; //reducing the detected hum and
noise

  if(totalR > maxR)
  {
    maxR = totalR;
  }

  indexR++;

  if (indexR >= numReadings)
  {
    indexR = 0;
    right = maxR;
    maxR = 0;
  }

  volR = right / 3;

  if(volR > 14)
  {
    volR = 14;
  }
  if (volR < (rightAvg - 2))
  {
    if (decayTime < actualMillis)
      rightAvg--;

    volR = rightAvg;
  }
  else if (volR > (rightAvg + 2))
  {
    volR = (rightAvg + 2);
    rightAvg = volR;
  }
  else
  {
    rightAvg = volR;
  }

  if (volR > rightPeak)
  {
    rightPeak = volR;
  }

  drawBar(volR, rightPeak, 1);

  volL = left / 3;

  if(volL > 14)
  {
    volL = 14;
  }

  if (volL < (leftAvg - 2))
  {
    if (decayTime < actualMillis)
      leftAvg--;

    volL = leftAvg;
  }
  else if (volL > (leftAvg + 2))
  {
    volL = (leftAvg + 2);
    leftAvg = volL;
  }
  else
  {
    leftAvg = volL;
  }

  if (volL > leftPeak)
  {
    leftPeak = volL;
  }

  drawBar(volL, leftPeak, 0);

  if (decayTime < actualMillis)
```

```
    decayTime = (millis() + 50);

  if (peakHold < actualMillis)
  {
    peakHold = (millis() + peakHoldTime);
    rightPeak = -1;
    leftPeak = -1;
  }
}

void drawBar(int data, int peakData, int row)
{
  //If the previous peak data is 1 or 0, then not taking care of the value.
  if (peakData < 2)
  {
    peakData = -1;
  }

  //First char (idx 0) = R or L
  //Last (16th) char (idx 15) is the closing mark of the bar.
  //We have 14 chars to write.
  for (int col = 1; col < 15; col++)
  {
    lcd.setCursor(col, row);

    if (col < data)
    {
      lcd.write(1); //write bar element
    }
    else if (peakData == col)
    {
      lcd.write(6); //write the peak marker
    }
    else
    {
      lcd.write(4); //write "empty"
    }
  }
}
```

## Schematics


Resistor for LED backlight. In case of some LCD's it might not needed! RTFM! Always! No excuse!
10KOhm - LCD contrast. Simply connect yellow wire to GND if you want full contrast.
Reference voltage is set to 1.8V 22KOhm
4pcs of 100KOhm resistors
Right input. Min: 700mVrms, Max: 2Vrms
Right input. Min: 700mVrms, Max: 2Vrms
100 or 220nF input capacitors (DC decoupling filter)
UNO
ARDUINO