

LCD Display \Rightarrow Contrast Problem — I²C Adapter.

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Solved by V_0 pin goes to negative when $V_{dd}=3.3V$

$V_{ss} \rightarrow GND$

$V_{dd} \rightarrow 5V$

$V_{dd}=5V$ & adjust the potentiometer on the back

$V_0 \rightarrow$ Pin 22 contrast adjustment. (9) $8.2mV \rightarrow 0V$

$R_s \rightarrow$ ~~23~~ 23 register select high (12) $4.08mV$ $4.44V$ (3, 24) Adapter

$R_{lv} \rightarrow GND$

$E \rightarrow$ ~~24~~ enable signal (11) $12.8mV$ $7.8mV$

$DB4 \rightarrow 25$

$DB5 \rightarrow 26$

$DB6 \rightarrow 27$

$DB7 \rightarrow 28$

} Bus

(5)

(4)

(3)

(2)

Mega — $4.86V$ (5V output) $4.7V$.

Mega2560 — Cannot use AnalogWriteResolution ()

pin, bits

$\rightarrow 256$ — 8bits PWM output. 4

default freq = $460Hz$.

Pin 12 & 4 : $180Hz$

}

timer 0 (13, 4) $\rightarrow 180Hz$

timer 1 (11, 12)

timer 2 (9, 10)

timer 3 (5, 3, 2)

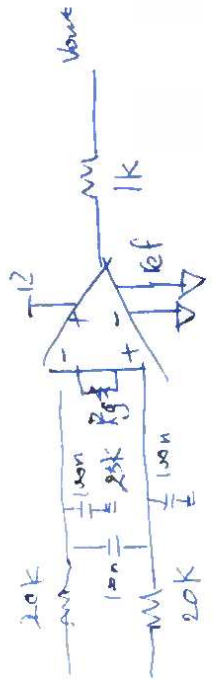
timer 4 (8, 7, 6)

} $460Hz$

Timer 1 library 1024

$$\frac{4.8}{1024} \rightarrow 4.69mV$$

$$\frac{100k}{25} + 1 = 5 \text{ Gain}$$



```
#include <Wire.h>
#include <LiquidCrystal_I2C.h> //Download it here: https://www.electrooobs.com/eng_arduino_liq_crystal.php
//Library for ADS1115 ADC
#include <Adafruit_ADS1015.h> //Download here: https://www.electrooobs.com/eng_arduino_Adafruit_ADS1015.php
Adafruit_ADS1115 ads(0x48); //Define I2C address
// Sometimes the address is 0x27 or 0x3f (try both)
LiquidCrystal_I2C lcd(0x27, 16, 2); //Address, columns, rows

const float multiplier = 0.0001875; //In order to pass from 16bits to real value voltage
int Buzzer = 3; //Pin for a buzzer (not yet used)
float offset = 0.004; //Constant offset (in A) that the read has (yours might be different)

void setup() {
  Serial.begin(9600);

  pinMode(Buzzer, OUTPUT);
  digitalWrite(Buzzer, LOW);

  ads.begin();
  delay(10);

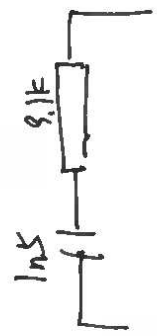
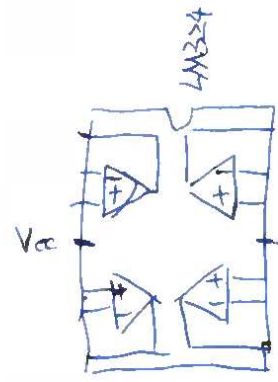
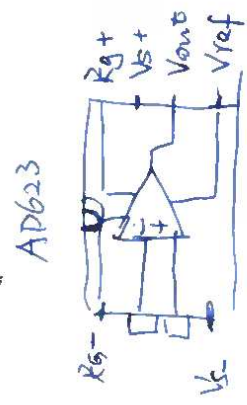
  lcd.init();
  lcd.backlight();
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print(" ELECTRONOBS ");
  analogWrite(Buzzer, 200);
  delay(100);
  analogWrite(Buzzer, LOW);
  delay(300);
  lcd.setCursor(0,1);
  lcd.print(" CONSTANT LOAD ");
  delay(1500);
}

void loop() {
  float set_val, real_val;
  real_val = ads.readADC_Differential_0_1(); //Read DIFFERENTIAL voltage between ADC0 and ADC1
  set_val = ads.readADC_SingleEnded(2); //Read voltage on potentiometer (this will be our setpoint)

  set_val = (set_val * multiplier) - offset; //Pass to real voltage and subtract offset
  real_val = real_val * multiplier - offset;

  //If we have negative value, we stay at 0.
  if(real_val < 0) {
    real_val = 0;
  }
  if(set_val < 0) {
    set_val = 0;
  }

  //Print data on LCD
  //lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("Set: ");
  lcd.print(set_val,3);
  lcd.print(" A");
  lcd.setCursor(0,1);
  lcd.print("Current: ");
  lcd.print(real_val,3);
  lcd.print(" A");
  delay(100);
}
```



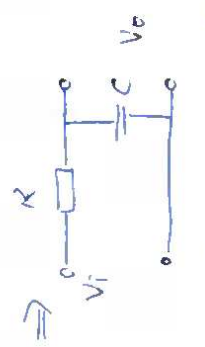
$$\frac{25mV}{6} = 4.16mV \rightarrow V_{ref} = 54mV$$

$$\frac{10}{92} = 0.1087$$

$$10 = 82mV$$

Since $V_{sense} = 88mV$
 $88 \rightarrow 500 (4pp)$

Gain ~ 5
 $\frac{100k}{20} = 5$

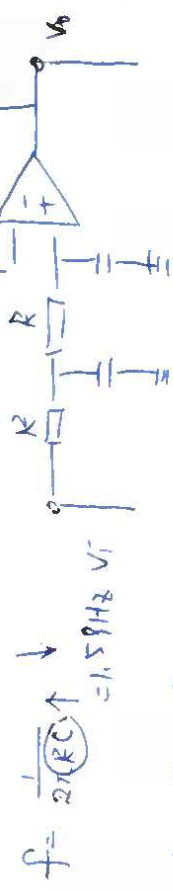


$R = 1k$ $C = 10\mu F$
 $= 10 \times 10^{-6} F$

$10^3 \times 10 \times 10^{-6} = 1 \times 10^{-2}$
 $= 0.01$
 $\frac{1}{RC} = \frac{1}{100} = 0.01$

Pin f = Freq 732Hz

\Rightarrow Relay 732
 $\frac{1}{RC} = \frac{1}{732} = 0.001366$
 $\frac{1}{7.3k \times C}$



$R = 10k$ $R_1 // R_f = 10k$
 $R_1 = 100k$ $R_f = 10k$
 $Gain = 1 + \frac{R_f}{R_1} = 1.1$

$R = 10k$ $C = 10\mu F$