

IR -- Overview

Proximity Sensing Using IR Sensor



OBJECTIVES

After performing this lab exercise, learner will be able to:

- Interface IR sensor with Arduino board
- Program Arduino board to measure small distances.
- Measure MAXIMUM amplitude of the captured signal using inbuilt functions of the scope.

EQUIPMENT

To carry out this experiment, you will need:

- TBS1KB - Digital Oscilloscope from Tektronix
- Arduino Duemilanve or Uno board
- Voltage probe (provided with oscilloscope) / BNC cables
- Breadboard and connecting wires
- Sharp IR proximity sensor

THEORY

- IR proximity sensor comprises of an IR emitter and a photodiode. IR emitter emits IR rays and photodiode detects the reflected radiations.
- Typically proximity sensors are used to measure distance of any object. As the object starts moving away from the sensor, the intensity of the reflected radiation keeps reducing.
- These radiations can be captured using a microcontroller and distance can be calculated accordingly.
- If the object is light coloured, it will reflect maximum radiations back to the sensor and if its dark coloured, it will absorb the majority of radiations and the sensor will detect a weak reflected radiation.
- **Maximum Value:** Value of highest amplitude point in the acquired signal, measured in volts.

ARDUINO CODE

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

```

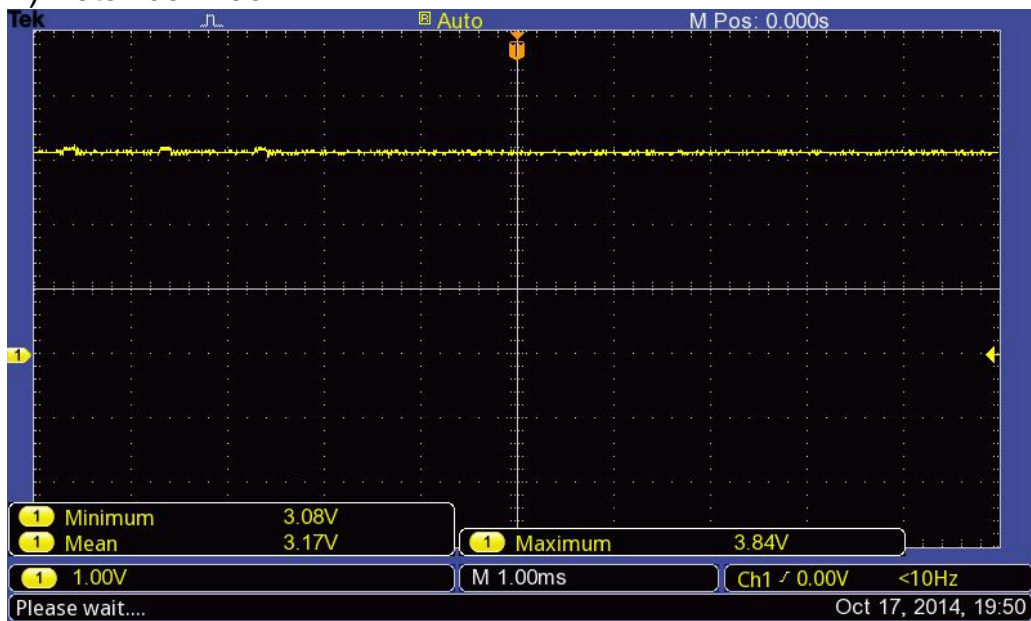
}

void loop()
{
  float volts = analogRead(A0)*0.0048828125;
  float distance = 65*pow(volts, -1.10);
  Serial.println(distance);
  delay(100);
}

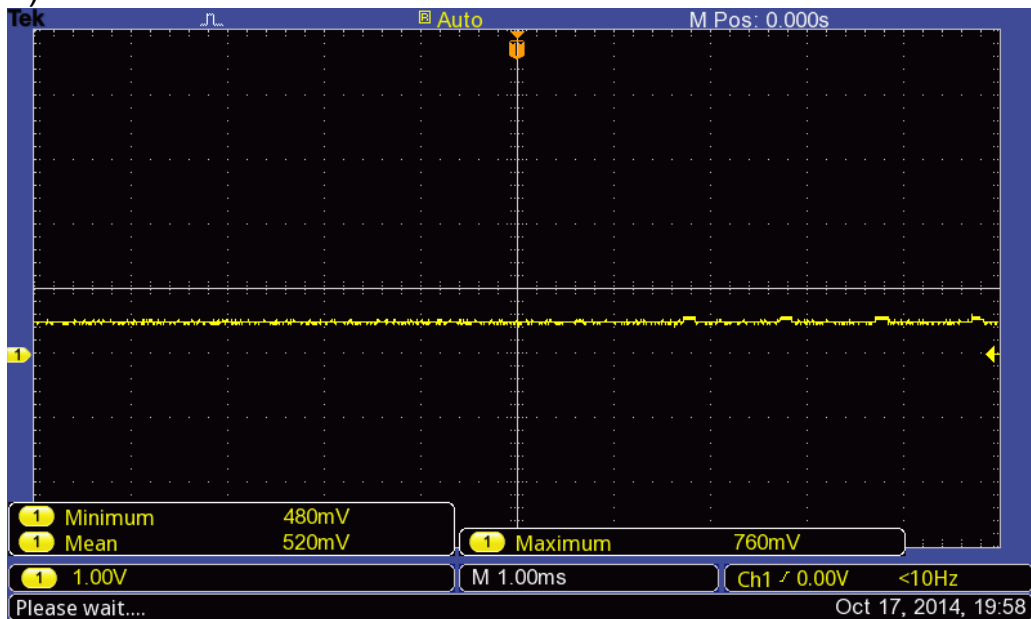
```

OUTPUT WAVEFORM

1) Distance = 6cm



2) Distance = 55cm

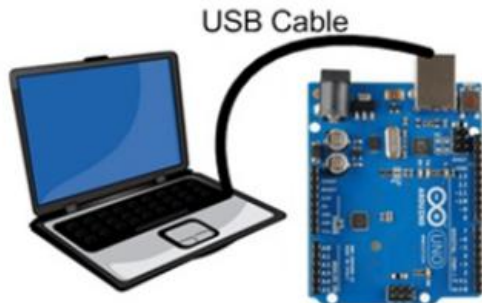


IR -- Procedures

Step 1

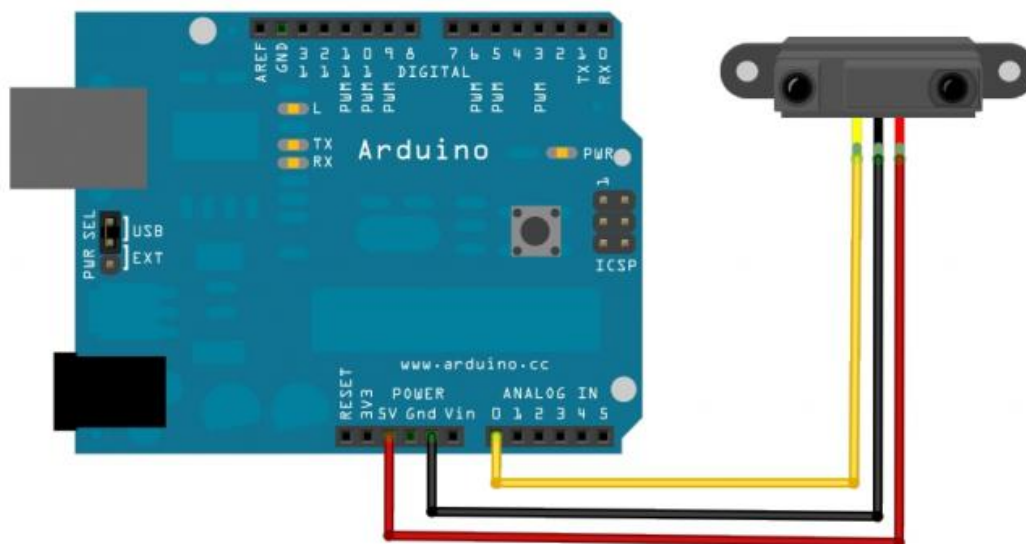
DUT / SOURCE SETUP

- Ensure you have Arduino IDE (software to program the Arduino boards) installed on your computer.
- Connect the Arduino board to PC using USB cable



Step 2

- Make the connections as shown below and fix the IR sensor at particular position.
- Keep a white body at a distance of 5cm from the sensor.
- Keep moving the object away from the sensor by 1cm and note the MAXIMUM measured voltage



Step 3

MEASUREMENT / SCOPE SETUP

- Power ON the oscilloscope
- Connect the Channel 1 probe of the oscilloscope to A0 pin of Arduino
- Acquire the signal(s) from circuit on oscilloscope

Step 4

- Do the Autoset on the scope to efficiently capture and view the signal
- If AUTOSSET feature is not enabled, then manually set the horizontal and vertical scale, and trigger condition to view waveform without any clipping.

Step 5

- From the measurement menu, configure MAXIMUM and MEAN measurements on acquired channel

Step 6

- Vary the distance between object and IR sensor (5 to 40 cms with the step of 2 cms) and measure the voltage
- Tabulate the distance versus measured MAXIMUM voltage.
- Plot the voltage Vs distance graph and validate if it matches that of the datasheet of the IR sensor.

