# Interfacing of Ultrasonic Sensor

# Ultrasonic Sensor HC-SR04

An **ultrasonic sensor** is an instrument that measures the distance to an object using **ultrasonic** sound waves. An **ultrasonic sensor** uses a **transducer** to send and receive **ultrasonic** pulses that relay back information about an object's proximity.

# Working principle of Ultrasonic Sensor

- **Ultrasonic sensors work** by emitting sound waves at a frequency too high for humans to hear. Then they wait for the sound to be reflected back, calculating distance based on the time required. This is similar to how radar measures the time it takes a radio wave to return after hitting an object.

- The HC-SR04 offers excellent non-contact range detection with high accuracy and stable readings in an easy-to-use package from 2 cm to 400 cm or 1" to 13 feet.

# Working Diagram

This is a 2x16 line LCD Display
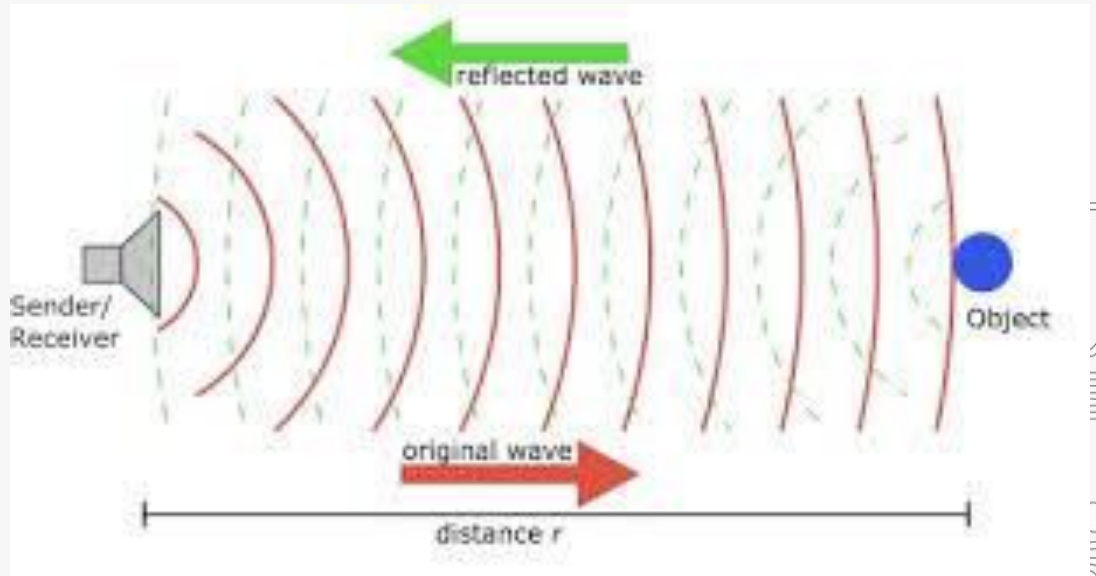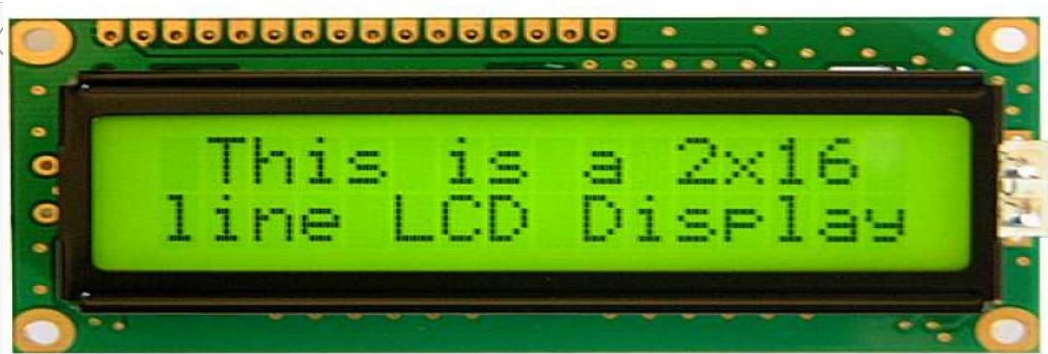
# LCD (Liquid Crystal Display)

Liquid crystal displays (LCDs) are a commonly used to display data in devices such as calculators, microwave ovens, and many other electronic devices.

Now, we will learn how to use a 16x2 LCD with Arduino UNO. As shown in the table below, eight of the pins are data lines (pins 7-14), two are for power and ground (pins 1 and 16), three are used to control the operation of LCD (pins 4-6), and one is used to adjust the LCD screen brightness (pin 3). The remaining two pins (15 and 16) power the backlight.

# Working of project

- There are two openings in Ultrasonic sensor first is transmitter (or Trigger) and second is receiver (or Echo).

- Ultrasonic sensor sends high frequency pulses, these pulses reflects from object and takes as Echo, time between echo and Trig is measured by the microcontroller or Arduino which is directly proportional to distance.

- The speed of sound is 341 meter per second in the air, and the distance between sensor and object is equal to time multiplied by speed of sound divided by two.
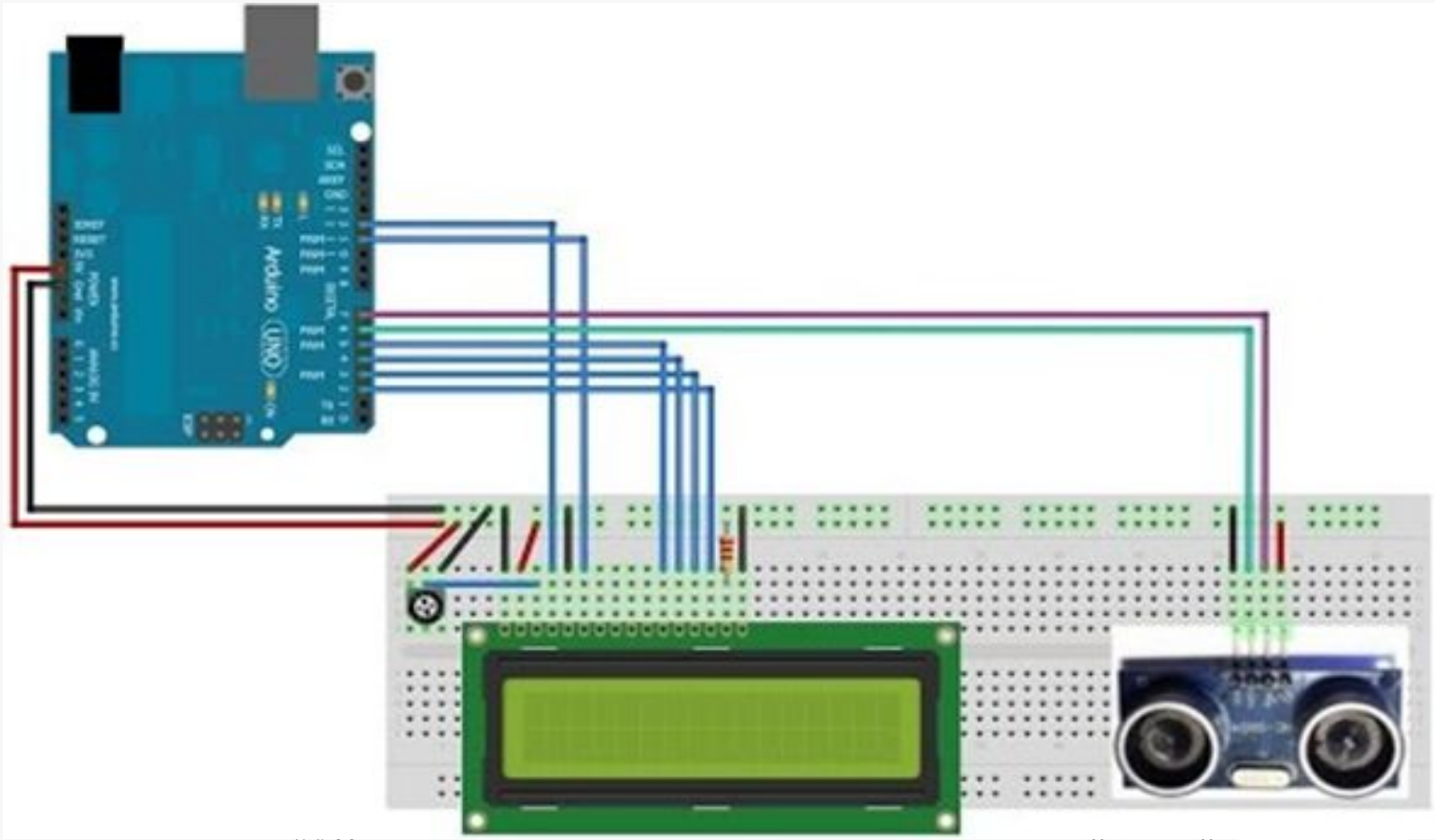
**Distance = (Time * Speed Of Sound) ÷ 2**

- After the distance measurement, LCD will display **Target Distance in cm**.

# Components Required

- Arduino UNO
- Ultrasonic Sensor HC-SR04
- LCD
- Potentiometer
- Breadboard
- Jumper wires

# Connection Diagram

# Connections for Ultrasonic Sensor

1. Connect **Trig** pin of Ultrasonic sensor with **7** pin of Arduino.

2. Connect **Echo** pin of Ultrasonic sensor with **6** pin of Arduino.

3. Connect **Vcc** pin of Ultrasonic sensor with **5V** of Arduino.

4. Connect **GND** pin of Ultrasonic sensor with **GND** of Arduino.

# Connections for LCD :

- PIN1 or Vss to ground
- PIN2 or Vdd or Vcc to +5V power
- PIN3 or Vee to potentiometer (gives maximum contrast best for a beginner)
- PIN4 or RS (Register Selection) to 12 pin of Arduino
- PIN5 or RW (Read/Write) to ground
- PIN6 or E (Enable) to 11 pin of Arduino
- PIN11 or D4 to 5 pin of Arduino
- PIN12 or D5 to 4 pin of Arduino
- PIN13 or D6 to 3 pin of Arduino
- PIN14 or D7 to 2 pin of Arduino
- PIN15 or A to +5V of Arduino
- PIN16 or K to GND of Arduino

# Code

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```
void setup()
{
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
  Serial.begin(9600);
  LCD.begin(16,2); //Tell Arduino to start your 16 column 2 row LCD
  LCD.setCursor(0,0);  //Set LCD cursor to upper left corner, column 0, row 0
  LCD.print("Target Distance:");  //Print Message on First Row
}

void loop() {
  long duration, distance;
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  duration = pulseIn(echoPin, HIGH);
   distance =( duration*0.034)/2;
 // distance = (duration/2) / 29.1; Alternate equation
 Serial.print("cm=");
Serial.println(distance);
  LCD.setCursor(0,1);  //Set cursor to first column of second row
  LCD.print("              "); //Print blanks to clear the row
  LCD.setCursor(0,1);   //Set Cursor again to first column of second row
  LCD.print(distance); //Print measured distance
  LCD.print(" cm");  //Print your units.
  delay(250); //pause to let things settle
}
```

**Project Link :**
**https://youtu.be/bGCXbVEhQHM**