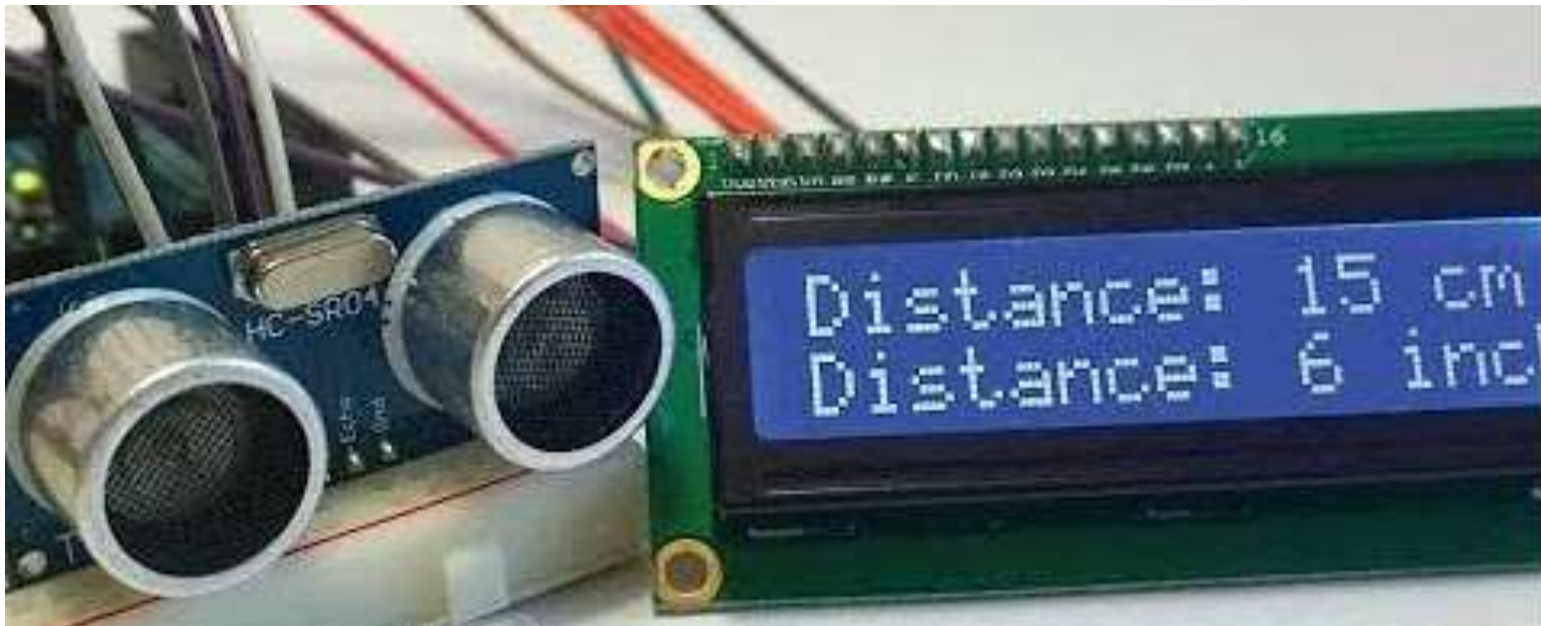


# Interfacing of Ultrasonic Sensor



# Ultrasonic Sensor HC-SR04

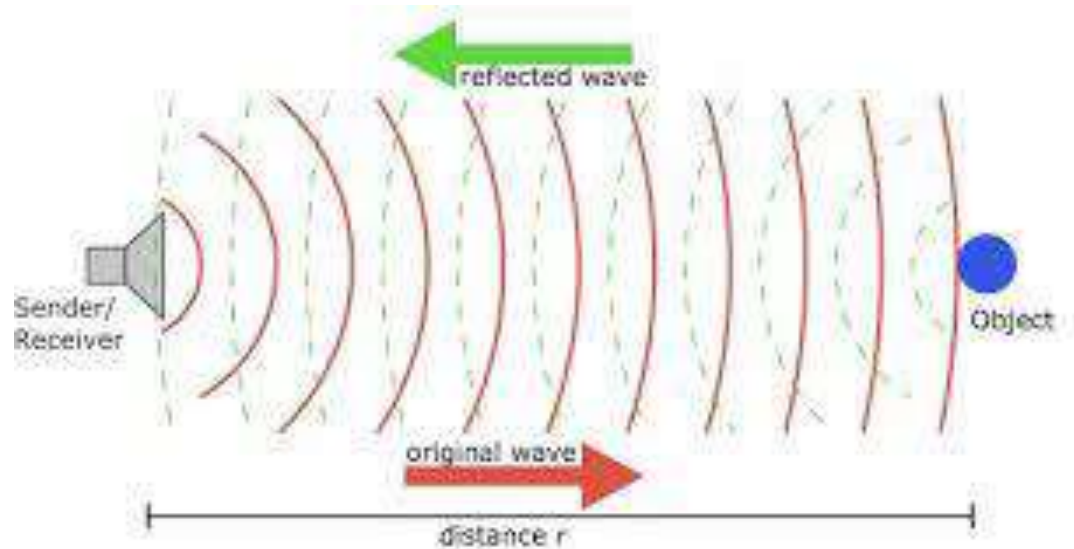
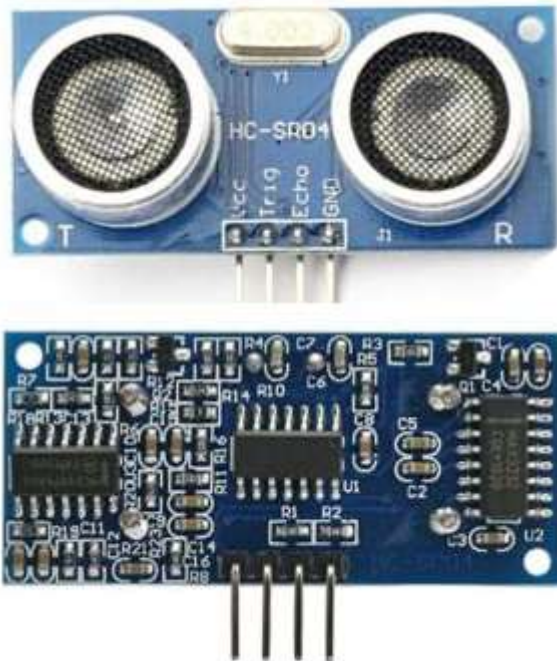
An **ultrasonic sensor** is an instrument that measures the distance to an object using **ultrasonic** sound waves. An **ultrasonic sensor** uses a **transducer** to send and receive **ultrasonic** pulses that relay back information about an object's proximity.



# 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



# 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 reflect from object and take 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.

$$\text{Distance} = (\text{Time} * \text{Speed Of Sound}) \div 2$$

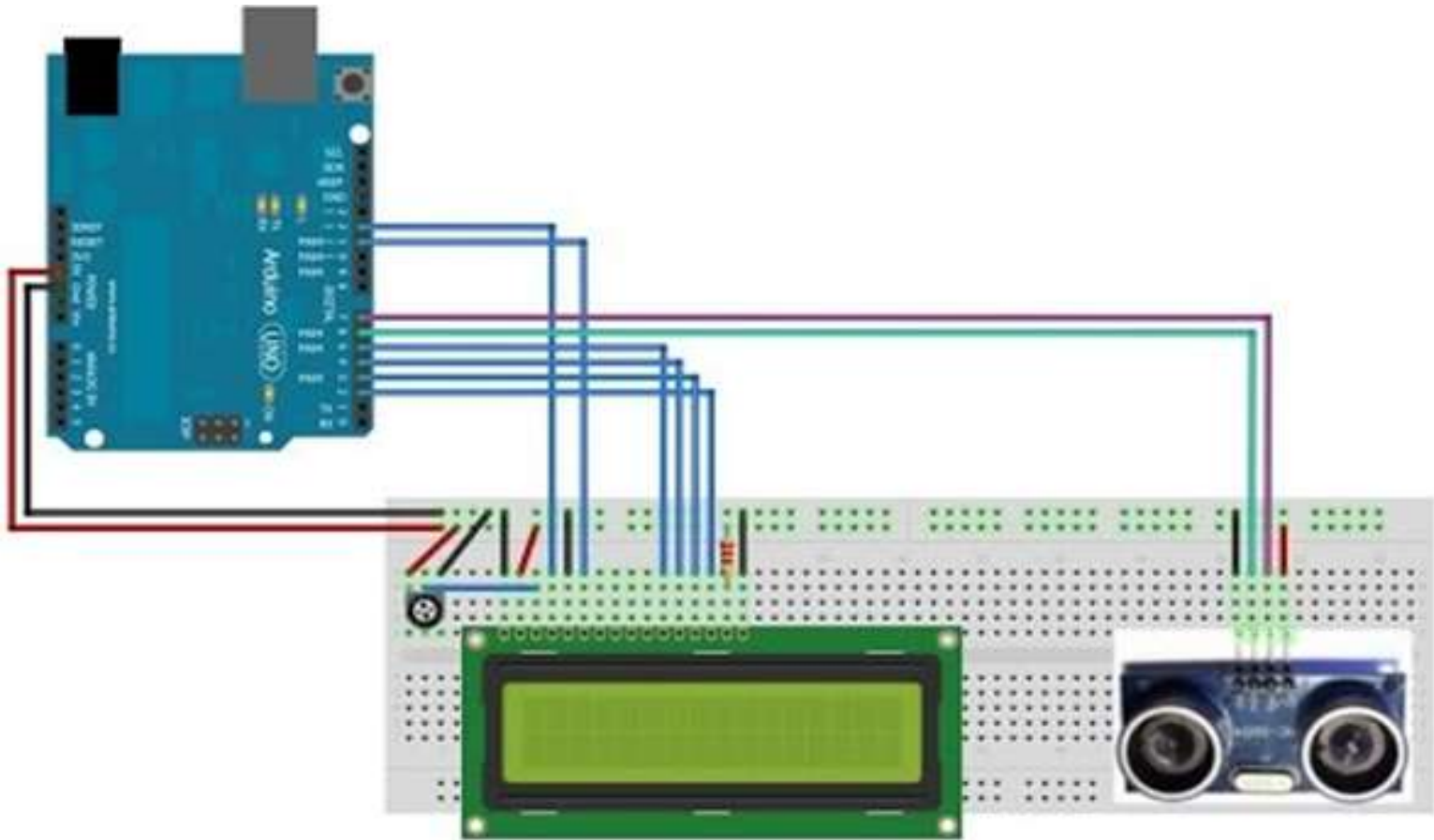
- After the distance measurement, LCD will display **Target Distance in cm.**

# 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

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