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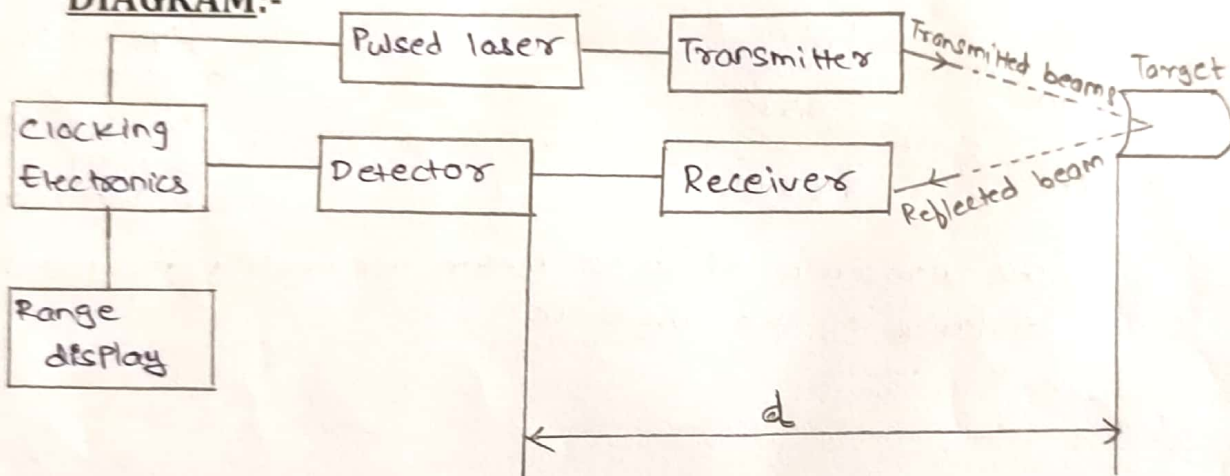**Experiment No.:- 05**        **Date:- 20|7|2021**
**(Module 4)**

## Study of Ultrasonic distance meter

**DJ19FEC202.4:** Interpret and explore basic sensing techniques for physical measurements in modern instrumentation.

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**AIM:** - The aim of this experiment is to study the functioning of ultrasonic distance meter.

**APPARATUS:** - Ultrasonic distance meter with Laser pointer and tape.

**DIAGRAM:-**



Block diagram of Ultrasonic Distance Meter

## Theory:-

The sound waves of frequencies beyond the upper audible limit of human being (f = 20 kHz) are called ultrasonic waves.

The method of distance measurement using ultrasonic is based on the pulse echo method. The measurement unit uses a continuous signal in the transmission frequency range of ultrasonic transducers. The signal is transmitted by an ultrasonic transducer, reflected by an obstacle and received by another transducer where the signal is detected. The time delay of the transmitted and the received signal corresponds to the distance between the system and the obstacle. The pulse echo or time-of-flight method of range measurement is subject to high levels of signal attenuation when used in an air medium, thus limiting its distance range.

## FORMULA:

Distance (D)=Velocity X Elapsed time   where, Velocity of ultrasonic waves in air = 330 metres/second

## PROCEDURE:-

1. Press the reset button to restart the meter.
2. Take three obstacles places at measured distances from the distance meter.
3. Measure each distance using the ultrasonic distance meter and verify that the ultrasonic distance meter gives accurate reading of distance.
4. Using the formula measure the elapsed time for all the distances.

## OBSERVATION TABLE:-

| Sr.No. | Actual Distance | Distance measured by Ultrasonic distance meter | Elapsed Time (s) |
|---|---|---|---|
| 1. | 1.30m | 1.31 m | 0.0039 $= 3.93 \times 10^{-3}$ sec |
| 2. | 2.55 m | 2.55 m | 0.00772 $= 7.72 \times 10^{-3}$ sec |
| 3. | 3.62 m | 3.62 m | $= 0.0109$ $= 1.09 \times 10^{-2}$ sec |

**RESULT:-** The ultrasonic distance meter accurately measures distance of the obstacle.

## COMMENTS:-

1. The ultrasonic flaw detector is used with defective and non-defective steel bar of thickness 40 cms. If pulse arrival times are 30µs and 80 µs, locate distance at which defect has occurred.

2. Write any two applications of ultrasonic sensor.

| D.J.S.C.E. (Physics) Journal | |
|---|---|
| Knowledge | 3 |
| Documentation | 3 |
| Punctuality | 3 |
| Virtual Lab (Performance & Documentation) | 6 |
| Total | 15 |

| Date | Signature of the faculty |
|---|---|
| | |

# Lab Manual Questions

**Sol·1)** Given: $d_{correct} = 40\,cm$

$\qquad t_{correct} = 80\,\mu s$

$\qquad t_{incorrect} = 30\,\mu s$

$\qquad d_{incorrect} = ?$

$\therefore \quad d \propto t$

$\therefore \quad \dfrac{d_{correct}}{d_{incorrect}} = \dfrac{t_{correct}}{t_{incorrect}}$

$\therefore \quad \dfrac{40}{d_{incorrect}} = \dfrac{80}{30} \implies \underline{d_{incorrect} = 15\,cm}$

**Sol·2)** The applications of ultrasonic sensor are:

1) It is used in robotic sensing.

2) It is used in liquid level control.

3) It is used in presence detection.