SERVO_MOTOR -- Overview

J∈D-1 CREATING GIFTED ENGINEERS	**JED-i Team** Trainer / Faculty The Joy of Engineering, Design and Innovation	J∈D-1 CREATING GIFTED ENGINEERS

OBJECTIVE

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

- Program Arduino board to control Servo motor
- Measure Duty Cycle of the captured signal using inbuilt functions of the scope

EQUIPMENT

- TBS1KB - Digital Oscilloscope from Tektronix
- Servo motor
- ARDUINO Uno board
- DSO Probes
- USB Pendrive (for saving measurement results / report)

THEORY

- A servomotor is a rotary actuator that allows for precise control of angular position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.
- Servo motors have three wires: power, ground, and signal. The power wire is typically red, and should be connected to the 5V pin on the Arduino board. The ground wire is typically black or brown and should be connected to a ground pin on the Arduino board. The signal pin is typically yellow, orange or white and should be connected to a digital pin on the Arduino board.
- Servos draw considerable power, so if you need to drive more than one or two, you'll probably need to power them from a separate supply (i.e. not the +5V pin on your Arduino). Be sure to connect the grounds of the Arduino and external power supply together.

SERVO_MOTOR -- Procedures

Step 1

Circuit / DUT Setup

- Build the circuit connection as per the given circuit diagram
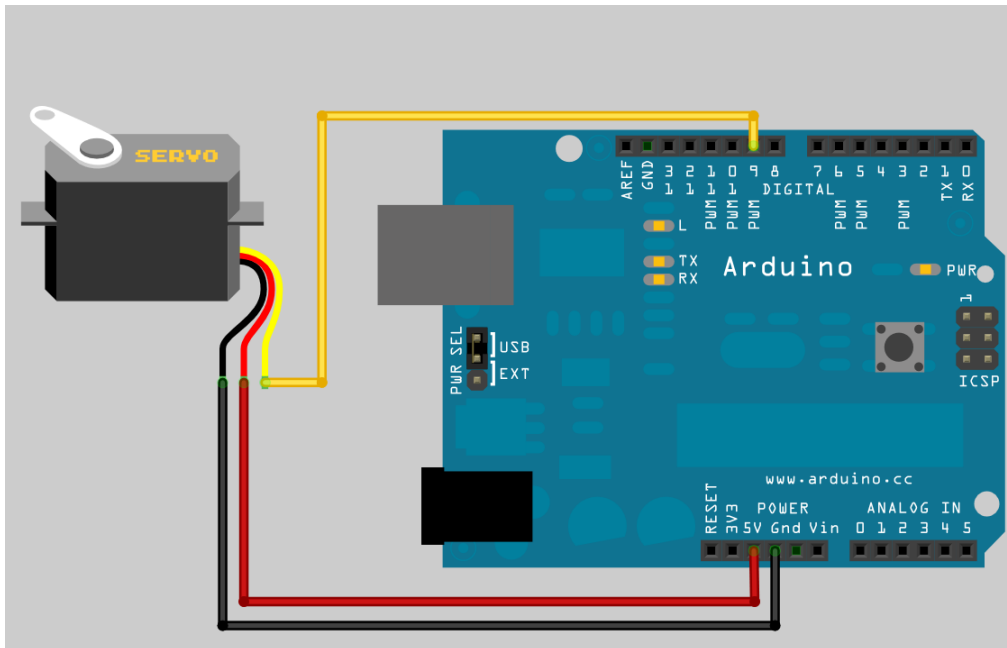
Step 2

- Write and upload the program using ARDUINO IDE.

Step 3

- Connect the oscilloscope across the digital pin 9 and ground pin of ARDUINO.

Step 4

- Adjust the duty cycle of the PWM output to 20%, by tweaking the Arduino code. Run the updated code on Arduino.

Step 5

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

Step 6

-
- Add DUTY CYCLE measurement on the scope for acquired channel

Step 7

- Capture the PWM input to servo motor on the oscilloscope
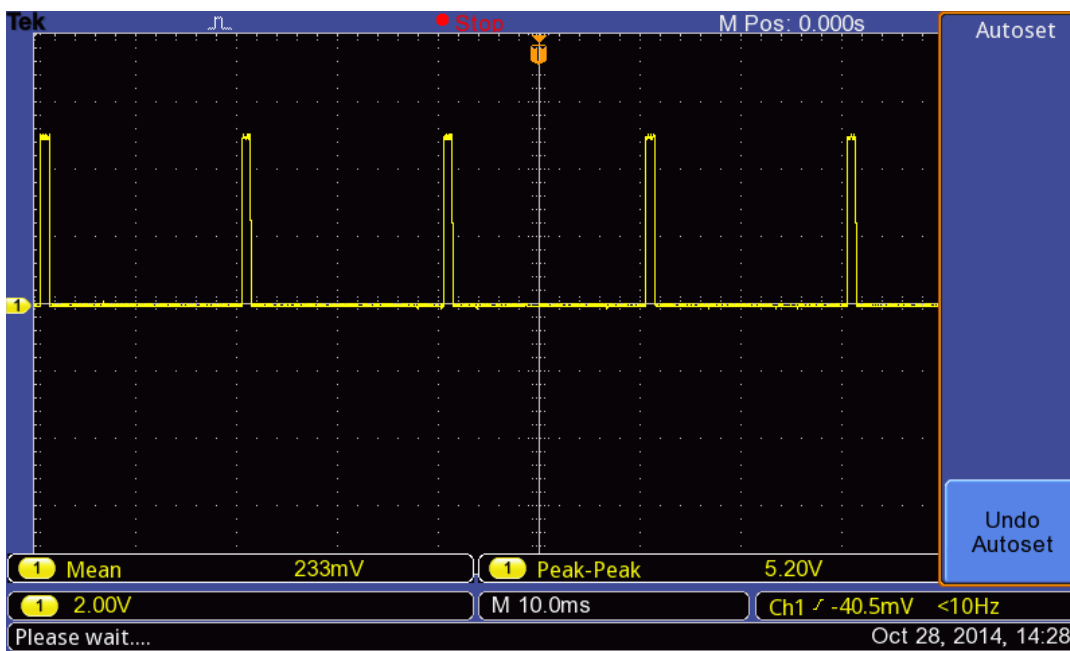
- Observe the angle of the servo motor

Step 8

- Trying chaning the PWM duty cycle and record the angle of servo motor for those input.

Step 9

OUTPUT WAVEFORM

The output waveform would look like the following,

Angle: 30degree

Step 10

RESULT
Plot the Angle (servo output) against the PWM duty cycle (%)