

HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY FACULTY OF TRANSPORTATION ENGINEERING

DESIGN OF MITSUBISHI XPANDER OXYGEN SENSOR VOLTAGE SIGNAL SIMULATOR

0.1ms

✓ Read A0 and A1 channel, calculate voltages

✓ Calculate and update duty cycles of PWM1 and PWM2

Start

Setup Timer/Counter 1, GPIO

 $_{flag} = 1$

 $_{\text{flag}} = 0$

Read A0 and A1 chanel

Calculate voltages

Calculate duty cycle 1 and 2

Update duty cycle

1>0

End

FALSE

Figure 4.1: Electrical diagram in Proteus Simulation

Virtual Terminal

Figure 4.2: Oxygen signal in

simulation of sensor1

RV1

TRUE

✓ Remove flag

FALSE

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Timer/Counter

PWM2

I. INTRODUCTION

- > Project on The Mitsubishi Xpander Oxygen Sensor Voltage Signal.
- The aim of the project is to simulate 2 signals OS1 and OS2 (Oxygen sensor Signal 1 and Oxygen sensor Signal 2).
- ➤ The requirement of the project that the output signals closely resembles the oxygen sensor signals of Mitsubishi Xpander.

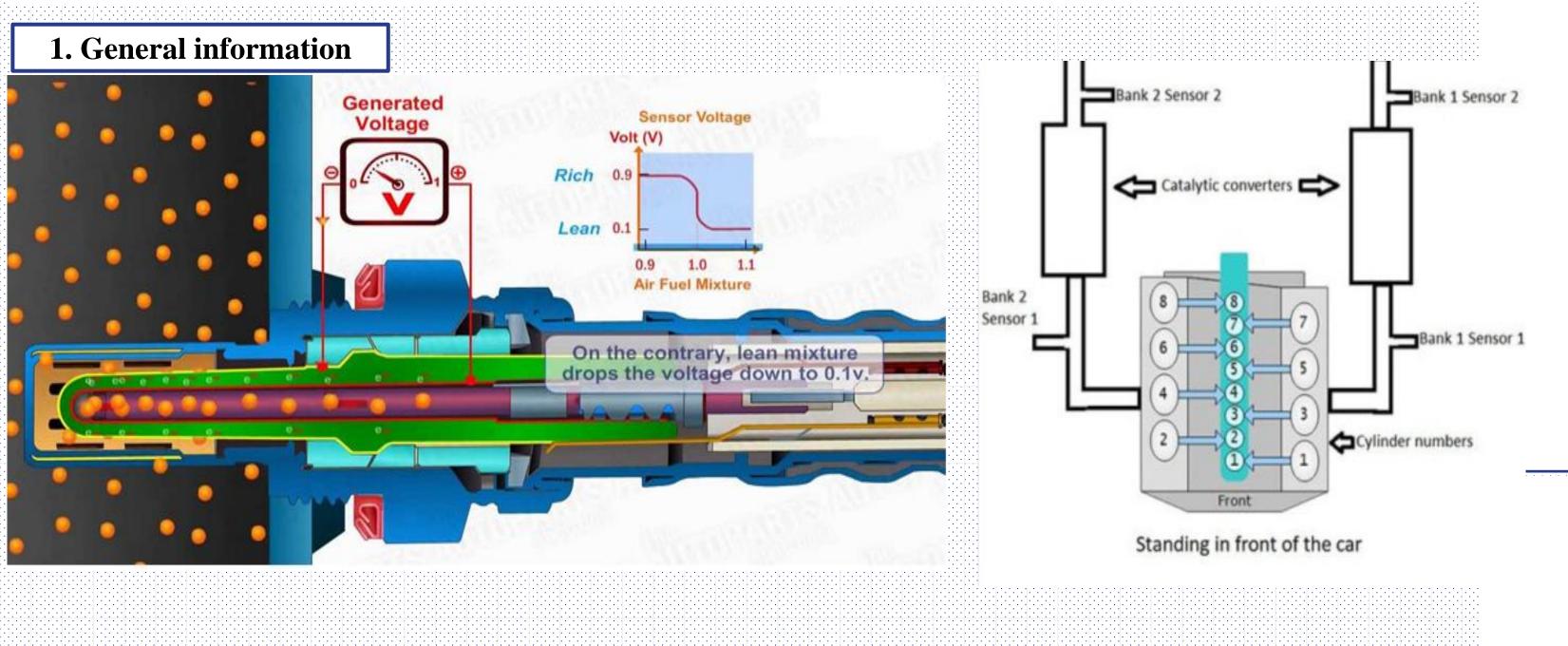


Figure 1.1: Narrow-band oxygen sensor

Figure 1.2: Location oxygen sensor

- > Located within the emissions control system.
- > Ensure that the engine is running at top condition
- The differences in oxygen levels between the bulb and the outside atmosphere generates voltage.

II. GENERAL LAYOUT DESIGN

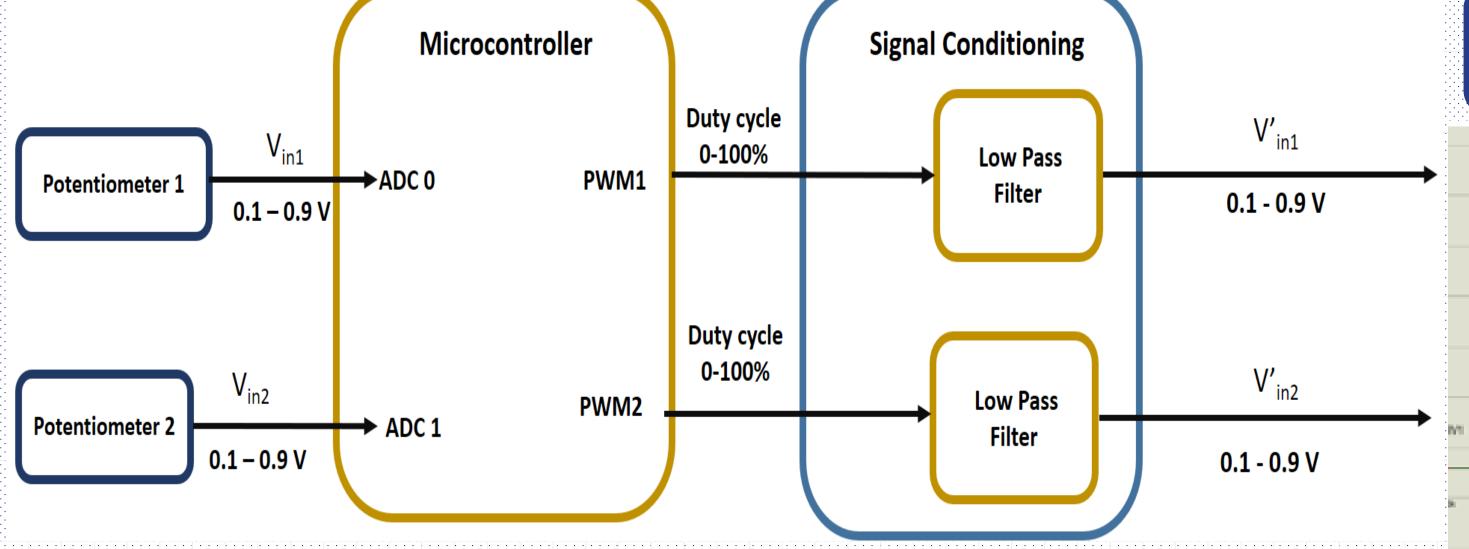
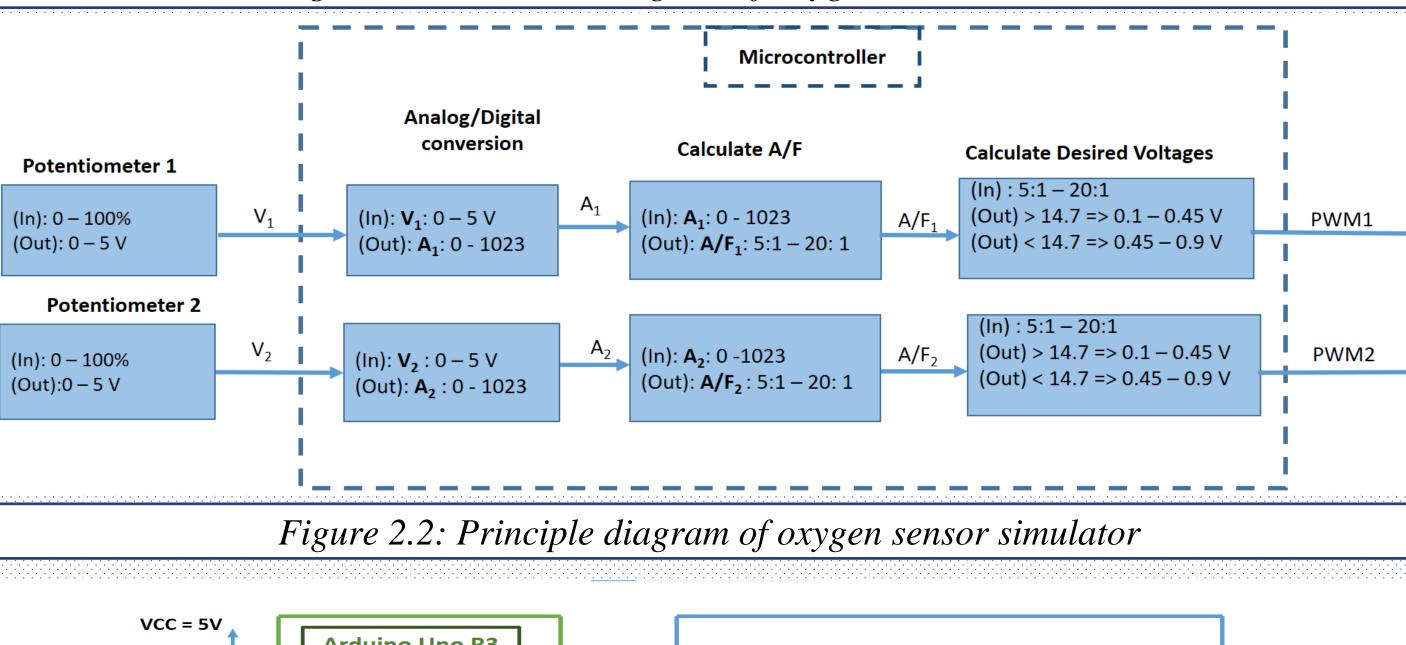


Figure 2.1: Structure diagram of oxygen sensor simulator



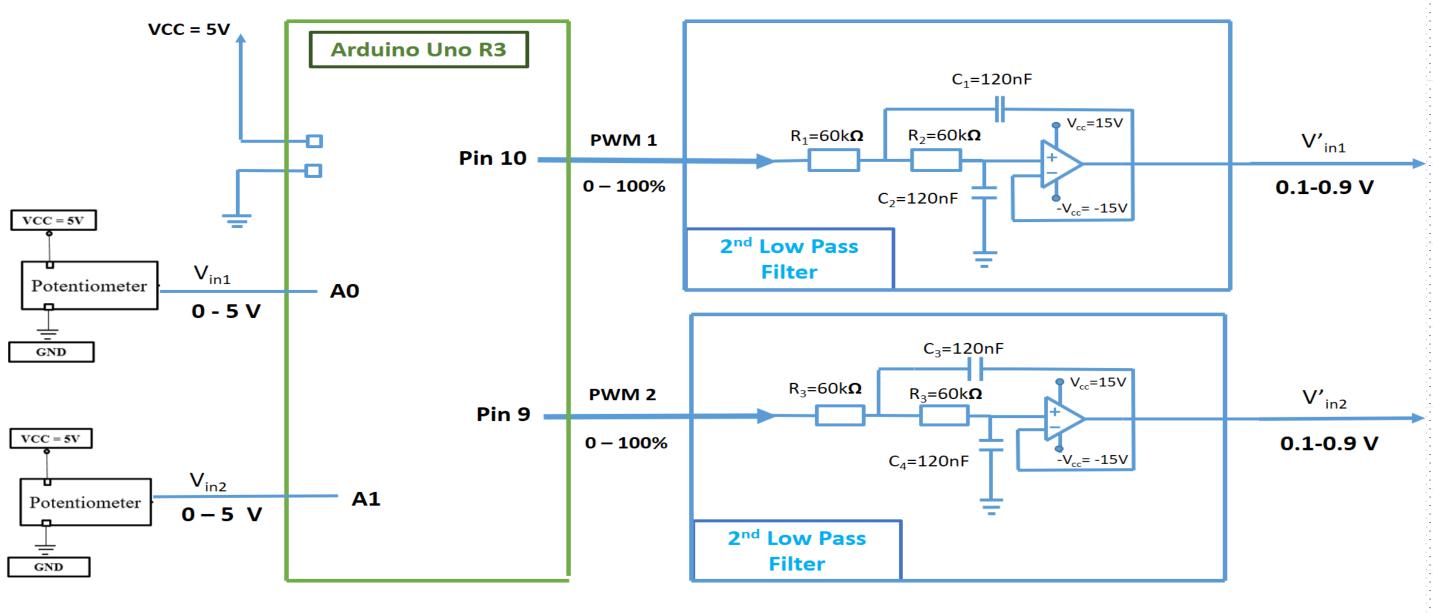


Figure 2.3: Electrical scheme

Figure 2.3: Electrical scheme

simulation of sensor2

0.6 0.4 0.2 740 760 780 800 820 840 860 880 900

Figure 4.5: Actual Oxygen

signal of sensor2

Figure 4.3: Actual Oxygen

signal of sensor1

Oxygen Sensor Output Volt...

0.885(V)

Oxygen Sensor Output Volt...

0.715(V)

Figure 3.2: Algorithms diagram of the program

III. TECHNICAL DESIGN

Figure 3.1: Timing diagram of the program

IV. SIMULATION AND RESULTS 1. Simulation: The simulation will described to the simulation will describe the simulation will be simulated by the simulation will describe the simulation will be simulated by the simulated by the simulation will be simulated by

1. Simulation:
The simulation will depend on the electrical scheme to check the result:

TIMER1 INTERUPT SERVICE ROUTINE

ISR(TIMER1 OVF VEC)

++_count_

count = 35

 $_{\text{count}} = 0$ $_{\text{flag}} = 1$

Return

TRUE

- 1) Create a input signal change continuously from 0-100% like the A/F ratio of 2 oxygen sensor 1 and 2 at pin A0 and A1
- 2) The two simulation signals OS1 and OS2 will display on screen through port A and C.
- 3) Pin RXD and TXD on Arduino are connected to pin TXD and RXD on Virtual Terminal to display voltage value of two signals OS1 and OS2.

2. Discussion:

Satisfied:

- ✓ Calculate the voltage value and display the PWM with low error.
- ✓ Simulating the signal as the actual oxygen sensor.

Unsatisfied:

- ✓ The shape of pulse is still not smooth.
- ✓ Potentiometer can't give signal like oxygen voltage so the pulse signal cannot as exact as reality.