SKILL ACTIVITY NO: 1

Date : 23/08/24

(To be filled by the Instructor)

Title : Identify the Commonly used symbols of Electrical & automotive electronics and to be able to read & draw in wiring diagrams.

Skills / competenies to be acquired :

1. To identify the symbols.
2. To draw the symbols.
3. To read the wiring diagrams
4. To be able to draw wiring diagrams
5.
6.
7.
8.

Duration of activity (hours) : 1

(To be filled by the Student)

1. What is the purpose of this activity ? (Explain in 3 - 4 lines)

The purpose of this activity is to be able to identify the commonly used symbols of electrical and automotive electronics and also to be able to read & draw in wiring diagrams.

2. Steps performed in this activity (Explain in 5 - 6 lines)

1) Identification of Electrical / AME symbols.
2) Draw different symbols.

3. What resources / materials / equipments / tools did you use for this activity ?

1. Stationery material.
2. Internet
3. Reference book, PDF.
4.
5.
6.
7.
8.

4. What skills did you acquire ?

1. To identify the symbols.
2. To draw the symbols.
3. To read the wiring diagrams.
4. To be able to draw wiring diagrams.
5.
6.
7.
8.

5. Time taken to complete the activity ? 1 (hours)

(Signature)
Instructor

(Signature)
Student

(To be filled by Instructor)

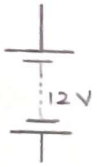
Sr. No.	Skills / Competencies	Achieved / Not Achieved (YES / NO)
1)	To identify the symbols.	Ys
2)	To draw the symbols.	
3)	To read the wiring diagram.	
4)	To be able to draw wiring diagrams.	

Remarks

Total marks 09 out of 10.

Sign of Instructor
Date: 18/11

Primary Cell



Battery

Terminal

DC supply

Fuse

Single Junction

Double Junction

Crossing of conductors with no electrical connection

PNP Transistor

NPN Transistor

Resistor

Variable Resistor

Potentiometer

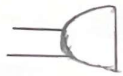
Microphone

Loudspeaker

Capacitor

Polarized Capacitor

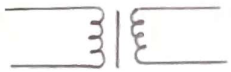
Pre-set Adjustment Capacitor



Buzzer

Heating Element

Inductor with magnetic core



Transformer with magnetic Core

Aerial

Lamp

Earth

Generator

Motor

Ammeter

Voltmeter

Oscilloscope

Frame

Switch

Break contact

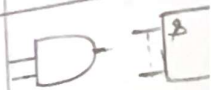
Relay coil

Make contact spring return

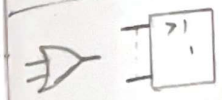
LDR
Light dependent resistor

Photodiode

Breakdown Diode



AND



OR

NOR

SPST
Basic ON/OFF

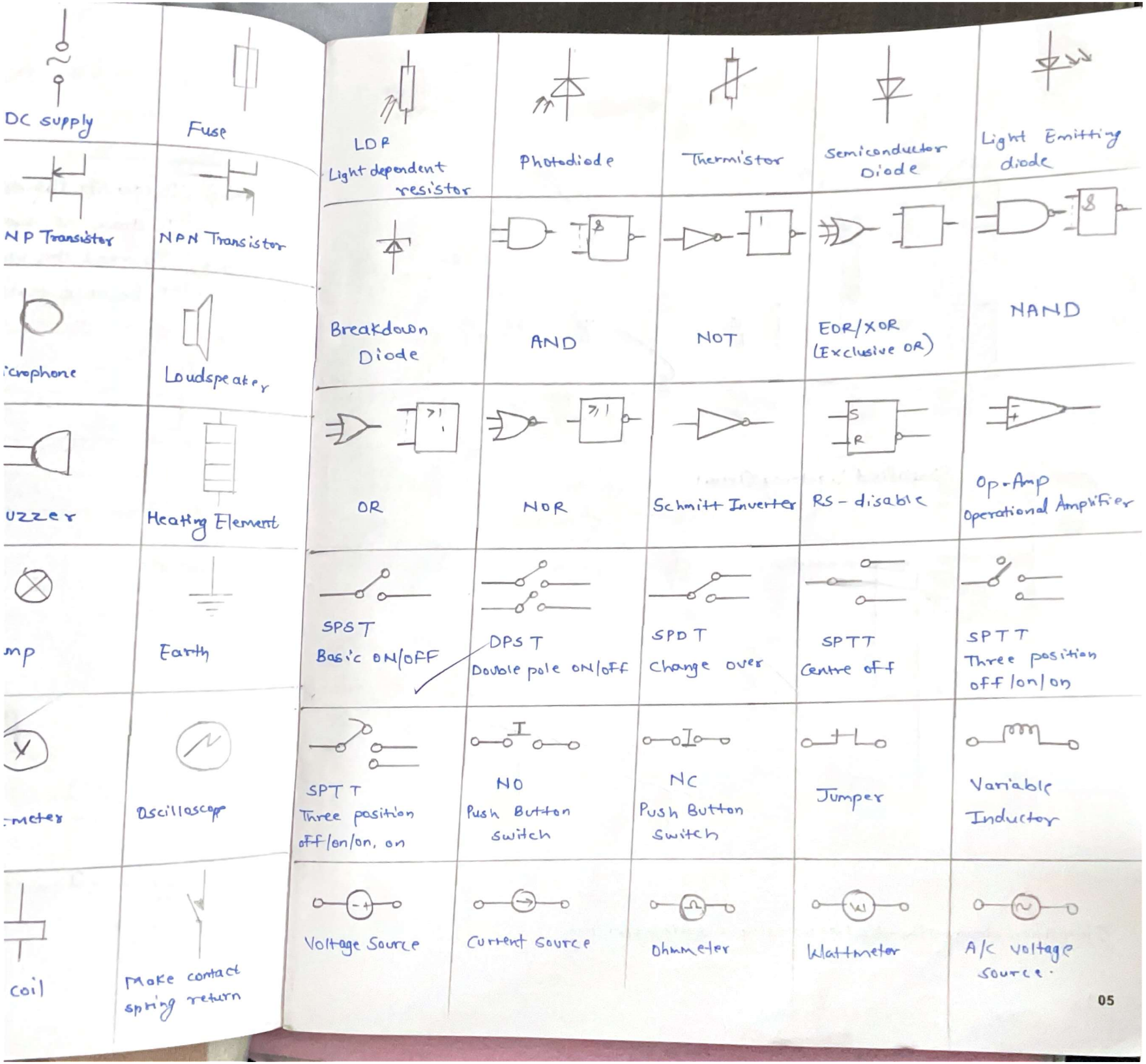
DPST
Double pole

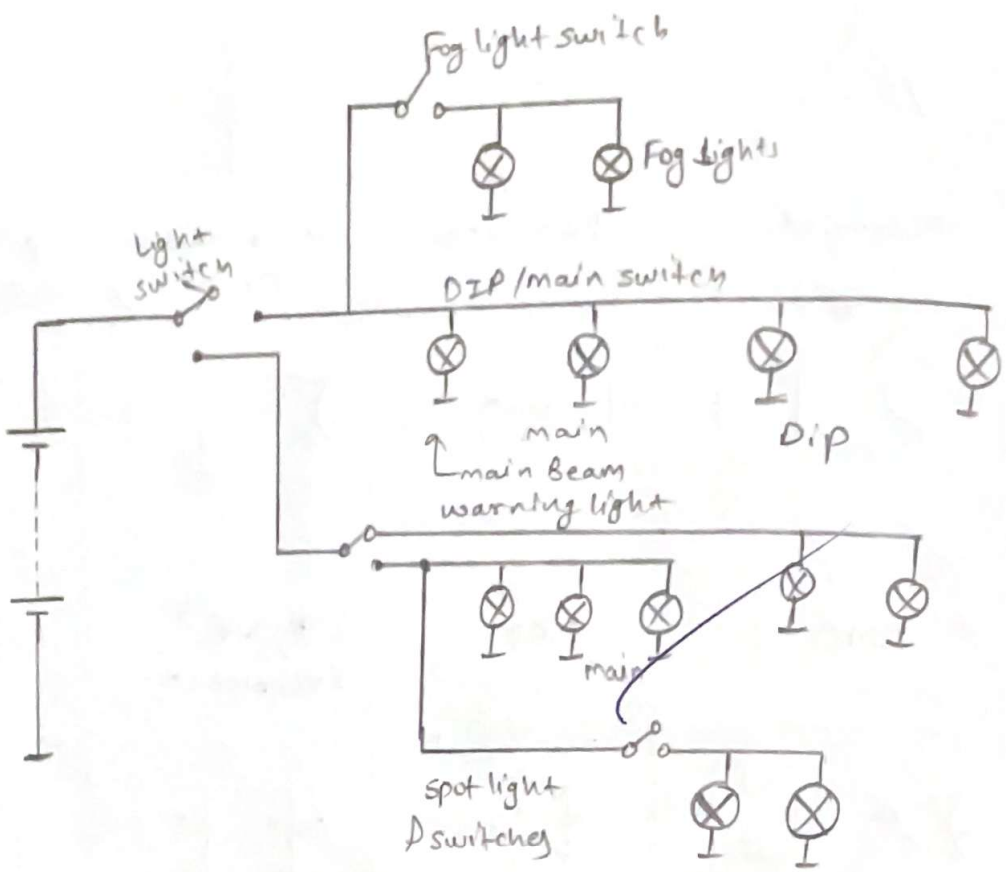
SPTT
Three position
off/on/on, on

NO
Push Button
switch

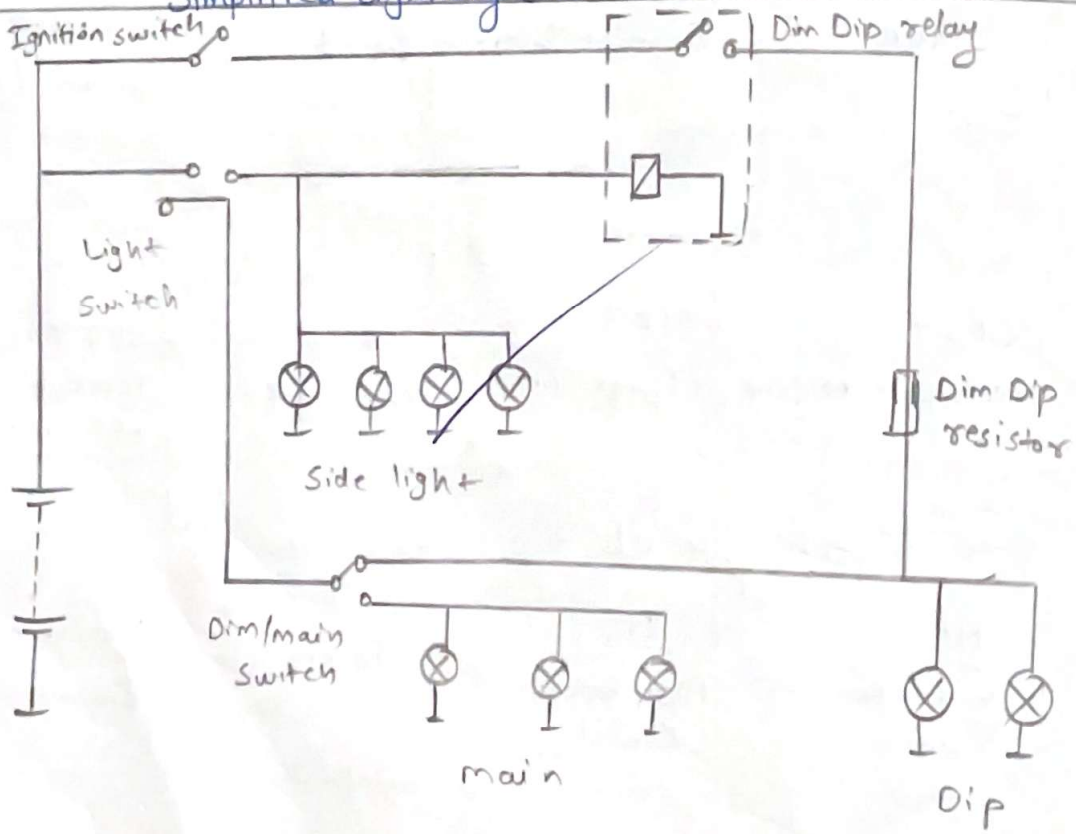
Voltage Source

Current Sou


DC supply
Fuse
LDR
Light dependent resistor
Photodiode
Thermistor
Semiconductor Diode
Light Emitting diode
NP Transistor
NPN Transistor
Breakdown Diode
AND
NOT
EOR/XOR (Exclusive OR)
NAND
icrophone
Loudspeaker
OR
NOR
Schmitt Inverter
RS - disable
Op-Amp Operational Amplifier
uzzer
Heating Element
SPST Basic ON/OFF
DPST Double pole ON/off
SPDT Change over
SPTT Centre off
SPTT Three position off/on/on
mp
Earth
SPTT Three position off/on/on, on
NO Push Button switch
NC Push Button switch
Jumper
Variable Inductor
meter
Oscilloscope
Voltage Source
Current Source
Ohmmeter
Wattmeter
A/C voltage source
coil
Make contact spring return



Simplified Lightning Circuit



Simplified circuit dim-dip lights using a series resistor.

(To be filled by Instructor)

Sr. No.	Skills / Competencies	Achieved / Not Achieved (YES / NO)
1)	To design the system.	
2)	Simulation.	
3)	Study of data sheet.	
4)	Selection of component.	
5)	Testing.	
6)	Debugging.	
7)	Result and analysis.	

Remarks

Total marks 09 out of 10.

Sign of Instructor
Date: 18/11

* Components Used *

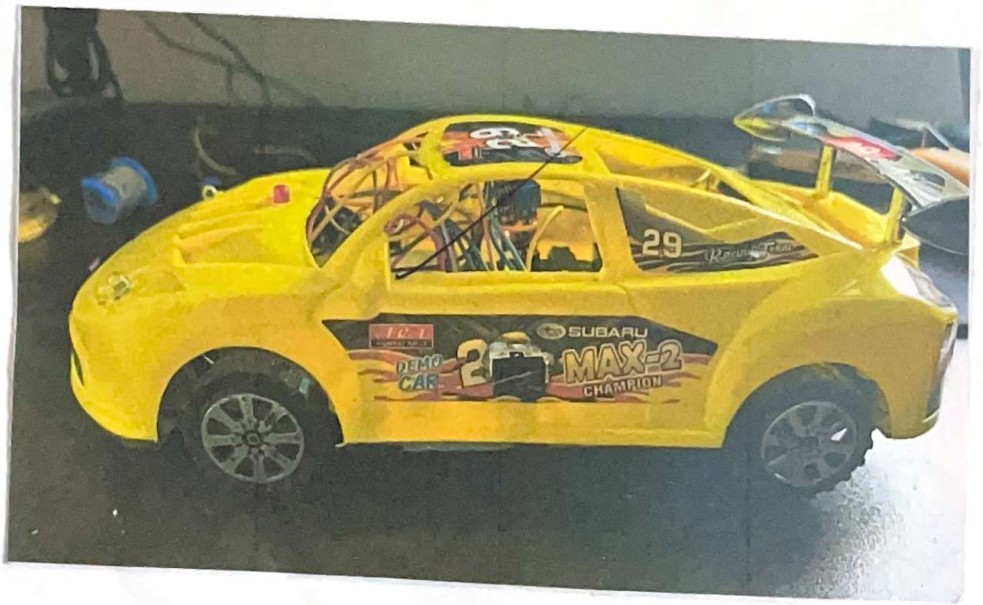
1) LDR sensor.
2) White Led X2
3) Mini Bread Board
4) Aurdino UNO
5) Crash sensor.
6) Red Led.
7) Buzzer.

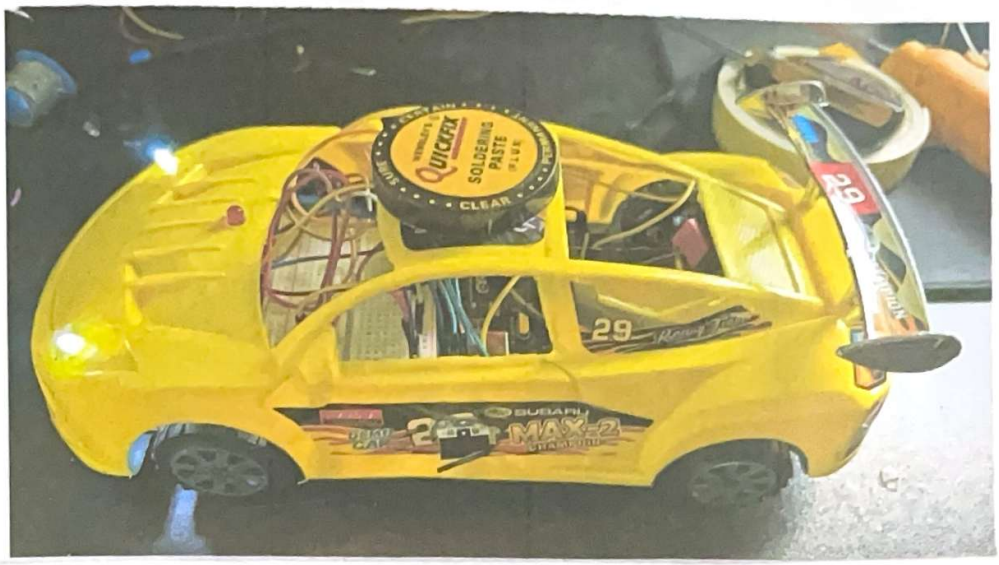
* Software Used :- Aurdino IDE.

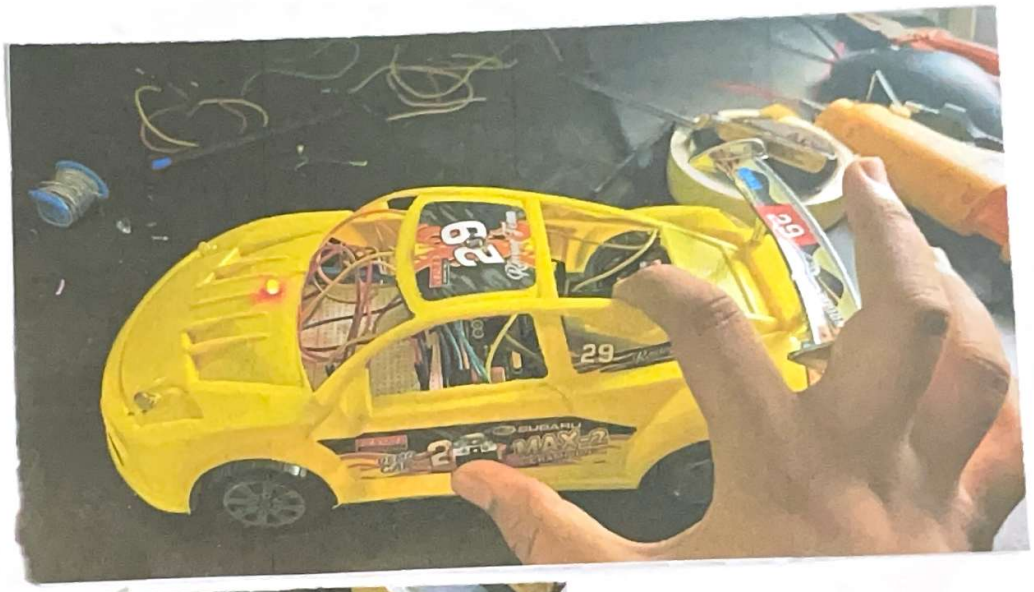
* Working *

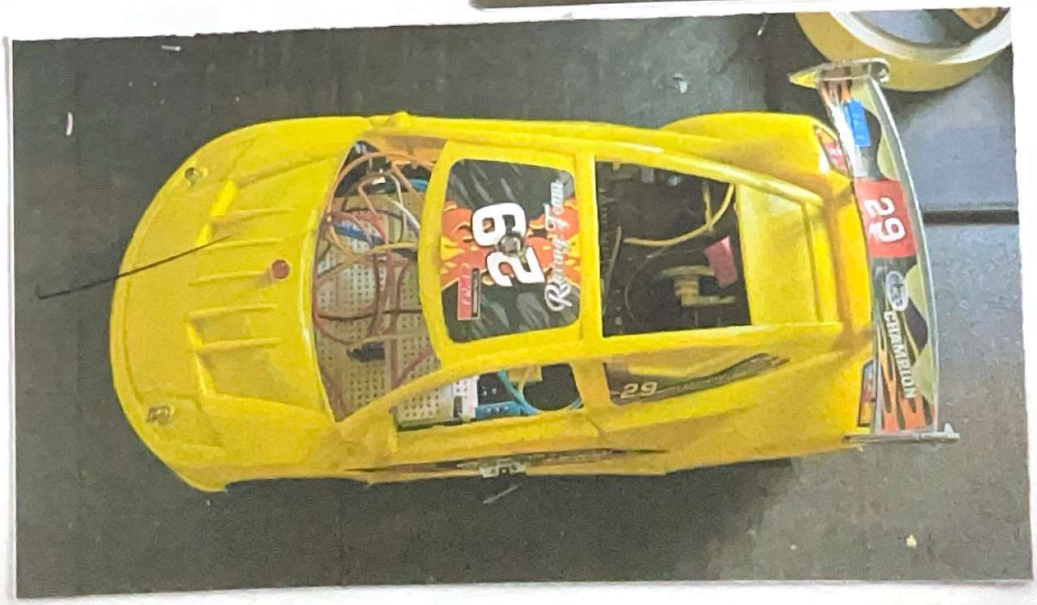
The LDR sensor detects the low level light when there is a dark light and no source of light the LDR sensor provides the signal to the aurdino then the aurdino UNO based on the signal of LDR sensor turn on the high intensity LED light for the driver to insure the visual efficiency of the driver.

The Crash sensor [limit switch] is installed on the side of the car which can be installed on the multiple points of car to get multiple input of the sensor which can determine the intensity of the accident in the car prototype, the crash sensor limit switch is pressed when the limit switch detects the input it sends signal to Aurdino in miliseconds to act fastly response when Aurdino gets the signal it turns on the Red Led and make buzzer ON. But in the future development the input of the crash sensor can be used to trigger the emergency services during the accident; giving the faster response to act which can save people during accident as the crash sensor plays a imp role during the accident, the crash sensor can also be interfaced to the airbag system to save the driver during the accident which can save many lives.




QUICKFIX
SOLDERING PASTE
CLEAR
29
SUBARU
MAX-2


29
SUBARU
MAX-2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SKILL ACTIVITY NO: 2

(To be filled by the Instructor)

Date : 10/9/24

Title : Design and implement ECU based control system in Automotive eletronics

Skills / competenies to be acquired :

1. Requirement Analysis
2. Selection of components
3. Simulation
4. Design finalazation
5. Hardware implementation
6. Testing
7. Debugging.
8. _____

Duration of activity (hours) : 1hr

(To be filled by the Student)

1. What is the purpose of this activity ? (Explain in 3 - 4 lines)

The main purpose of this activity is to implement an eletronic control Unit based control system in Automotive electronics.

2. Steps performed in this activity (Explain in 5 - 6 lines)

1) Decide a progject
2) Simulate if possible
3) Get the components.
4) Implement it practically.
5) test for the expected output & verify.
6) Trouble shoot & debug if as required.

* Working of Automatic Wiper.

- The automatic car wiper system uses a rain sensor, Arduino, and servo motor to adjust wiper speed based on rain intensity. The rain sensor detects the presence and intensity of rain and sends an analog signal to the arduino, which processes the data to categorize the rain as light or heavy. Depending on the intensity the Arduino controls the servo motor to operate the wipes at a corresponding speed. The wiper activates only when rain is detected and dynamically adjusts its speed in real-time as the intensity changes, when the rain stops, the system automatically shuts off the wiper, ensuring efficient and responsive operation.
- The LM393 comparator in rain sensor is responsible for converting the signal to digital signal that Arduino can process more effectively.
- The rain sensor produces a variable voltage depending on the amount of water detected on its surface. The comparator compares this voltage a reference voltage. and if the sensor's voltage exceeds the reference its output is high. signal (indicating rain) otherwise its output is a low signal (no rain).

3. What resources / materials / equipments / tools did you use for this activity ?

1. Arduino UNO
2. connecting wires.
3. Rain Sensor
4. Servomotor.
5. Power Source.
6.
7.
8.

4. What skills did you acquire ?

1. Requirement analysis
2. Selection of components
3. Simulation.
4. Design finalization
5. Hardware implementation
6. Testing.
7. Debugging.
8.

5. Time taken to complete the activity ? 1 hr (hours)

(Signature)
Instructor

(Signature)
Student

(To be filled by Instructor)

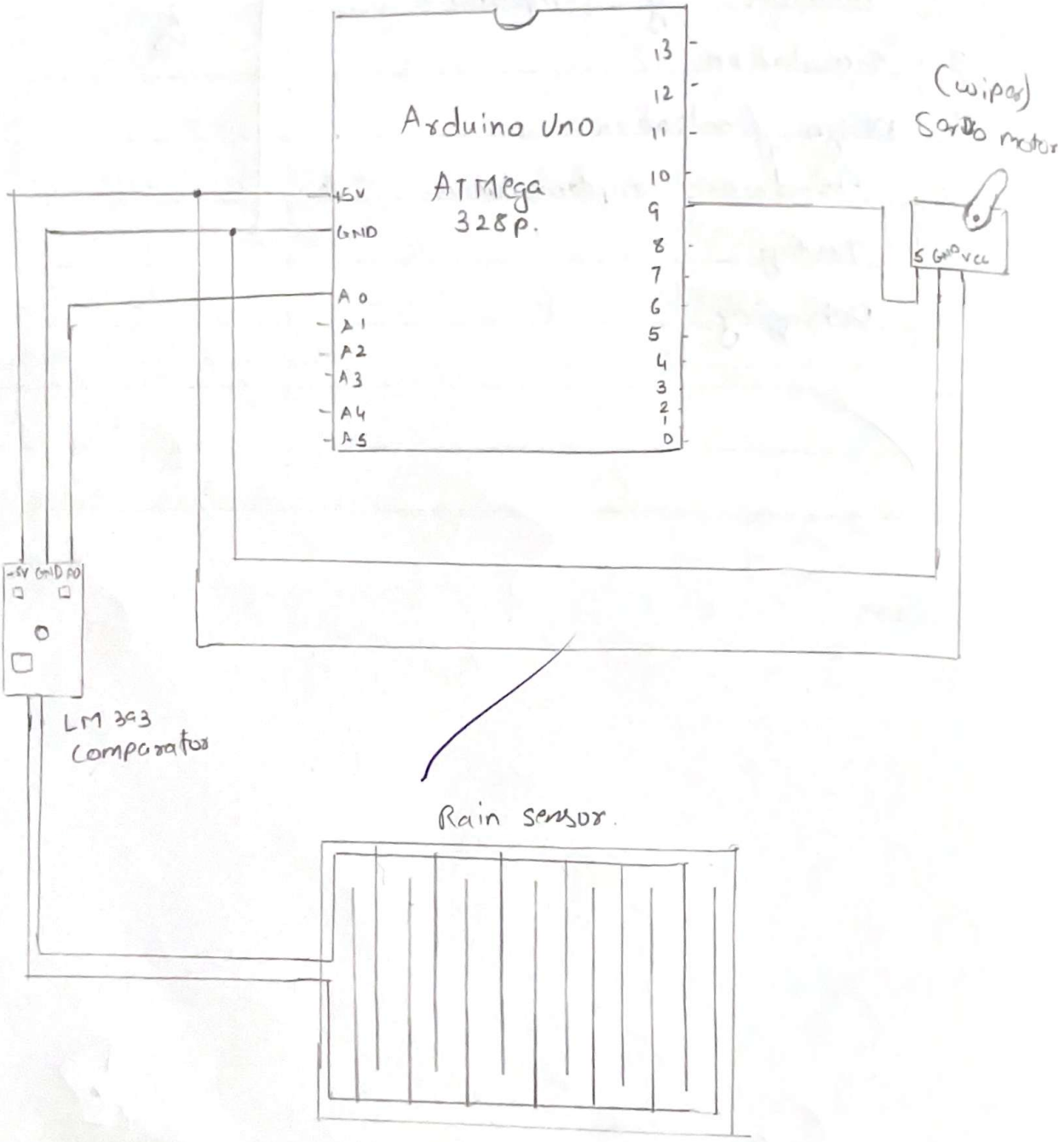
Sr. No.	Skills / Competencies	Achieved / Not Achieved (YES / NO)
1.	Requirement analysis	
2.	Selection of components.	
3.	Simulation.	
4.	Design finalization.	
5.	Hardware implementation.	
6.	Testing.	
7.	Debugging.	

Remarks

Total marks 08 out of 10.

Sign of Instructor
Date:

- Circuit diagram



```
#include <Servo.h>

Servo myservo;
Servo myservo1;

int pos = 0;
int sensorValue = 0;

void setup() {
  Serial.begin(9600);
  myservo.attach(5);
  myservo1.attach(9);
}

void loop()
{
sensorValue = analogRead(A0);
Serial.println(sensorValue);
if(sensorValue>900){
  myservo.write(0);
  myservo1.write(0);
  delay(1000);
  }
if(sensorValue<=80 && sensorValue>60)
{
   for (pos = 0; pos <= 120; pos+=1)
  {
    myservo.write(pos);
    myservo1.write(pos);
    delay(3);
  }

  for (pos = 120; pos >= 0; pos-=1)
  {
    myservo.write(pos);
    myservo1.write(pos);
    delay(3);
  }

  delay(2000);
}

if(sensorValue<=500 && sensorValue>420)
{

 for (pos = 0; pos <= 120; pos+=1)
  {
    myservo.write(pos);
    myservo1.write(pos);
    delay(3);
  }
  for (pos = 120; pos >= 0; pos-=1)
  {
    myservo.write(pos);
```

```
    myservo1.write(pos);
    delay(3);
  }

  delay(1000);
}

if(sensorValue<400){

   for (pos = 0; pos <= 120; pos+=1)
   {
     myservo.write(pos);
     myservo1.write(pos);
     delay(3);
    }

    for (pos = 120; pos >= 0; pos-=1)
    {
      myservo.write(pos);
     myservo1.write(pos);
      delay(3);
     }

     delay(100);
   }

   }
```

SKILL ACTIVITY NO: 3

Date : 11/10/24

(To be filled by the Instructor)

Title : Commonly observed faults in vehicle electronics their analysis and diagnosis.

Skills / competenies to be acquired :

1. Visual inspection.
2. Isolating the Faults.
3. Use of suitable tools.
4. Use of suitable instruments
5. Types of faults.
6.
7.
8.

Duration of activity (hours) : 1 Hour.

(To be filled by the Student)

1. What is the purpose of this activity ? (Explain in 3 - 4 lines)

The main purpose of this activity is to defect the commonly observed faults in vehicle electronics, their analysis and diagnosis.

2. Steps performed in this activity (Explain in 5 - 6 lines)

1) Understand the various faults in vehicle electronics.
2) Do the connection on LN Board.
3) Detect the faults with the help of the instructions given.
4) Diagnosis them respectively.

3. What resources / materials / equipments / tools did you use for this activity ?

1. LN labsoft software.
2. LN Interface
3. Connecting wires.
4.
5.
6.
7.
8.

4. What skills did you acquire ?

1. Visual inspection.
2. Isolating the faults
3. Use of suitable tools.
4. Use of suitable instruments.
5. Types of faults.
6.
7.
8.

5. Time taken to complete the activity ? 1 Hr. (hours)

(Signature)
Instructor

Rekadam
(Signature)
Student

(To be filled by Instructor)

Sr. No.	Skills / Competencies	Achieved / Not Achieved (YES / NO)
1)	Visual inspection.	
2)	Isolating the faults.	Y
3)	Use of suitable tools.	
4)	Use of suitable Instruments.	
5)	Types of faults.	

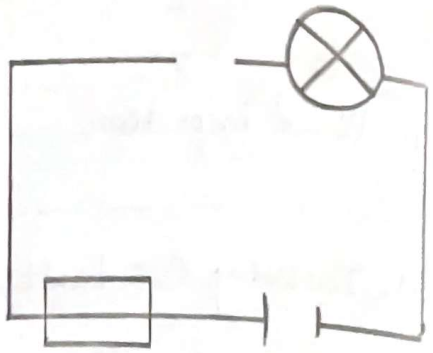
Remarks

Total marks 09 out of 10.

Sign of Instructor
Date: 18/11

* Diagnosis of breaks in Circuits :-

An open circuit is a physical break in the path of current flow. In series the circuit has no current flow and stops operating. In parallel ~~circuit~~ circuit will stop the operation in that particular circuit but the other individual circuits will continue to operate.



Causes :-

- Disconnected plugs.
- Faulty switches
- Poor electrical contact
- Servered or damaged wiring.
- Blown or defective fuses.

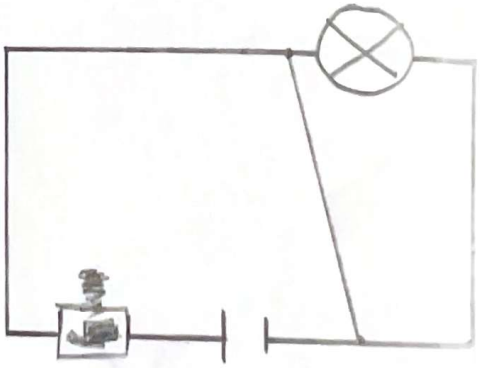
Diagnosis :- Jumper wire possessing a fuse can be used to by pass circuit segment.

* Diagnosis of short circuit to the ground :-

A short circuit to ground occurs whenever a circuit finds a path to ground before going through the load. Because current flow is no longer controlled by the resistance of the load, accessive current flow causes the fuse or circuit breaker to blow and open the circuit causing the current to stop flowing.

Locating short circuits :-

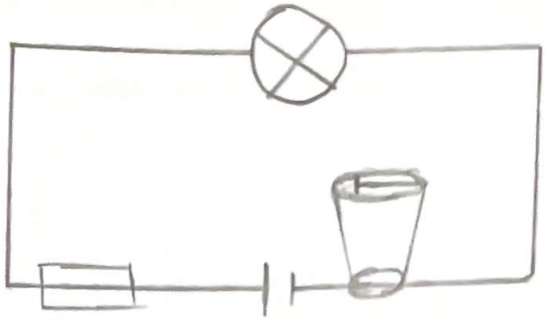
- Look at wiring diagram will give few idea where to search.
- Fault must be present inside or upstream of load.
- Visual check might reveal which wire damaged/crushed or has damaged insulation.



Diagnosis :- Replace Fuse.

* Diagnosis of Faults due to high resistance :-

High resistance faults are very similar to open circuit faults, but instead of having infinite resistance stopping current flow completely a high resistance add series resistance to the circuit to restrict current flow.



Faults can cause :-

- Operate erratically.
- Operate partially, such as a dim globe or slow.
- Not operate at all.

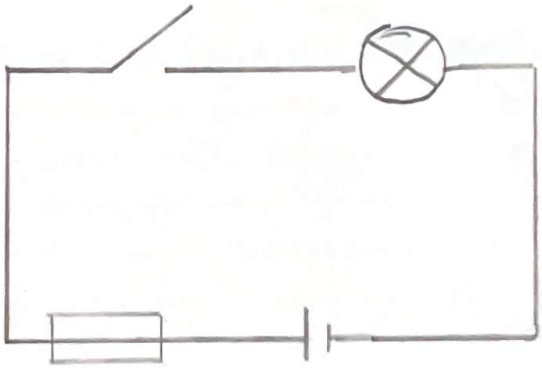
Diagnosis :- Repair or Replacing damaged wiring & connectors, Faulty components.

* Diagnosis of short circuit to positive :-

Short to voltage is a condition where a circuit due to insulation breakdown, causes the conductor to bypass the switching for that circuit or to contact the voltage of another circuit and the circuit to operate without input from the driver. This can also be possible draw which is when an excessive current is flowing while the car is turned off and can cause the battery to go flat in a short time.

Locating short to voltage :-

- Isolate circuits by removing fuses and connectors.
- Observe symptoms when operating other circuits to find possible 'crossed circuits'.



Diagnosis :- Replacing Blown fuse, Repairing or Replacing Damaged Wiring secure the wiring, replacing faulty components, re-checking grounds.

SKILL ACTIVITY NO: 4

Date : 24/10/24

(To be filled by the Instructor)

Title : Design and Implementation of PWM based automative application.

Skills / competenies to be acquired :

1. PWM Concept.
2. Frequency & duty cycle functions.
3. Selection of components.
4. Design.
5. Implementation.
6. Testing
7. Debugging
8.

Duration of activity (hours) : 1 Hour.

(To be filled by the Student)

1. What is the purpose of this activity ? (Explain in 3 - 4 lines)

The main purpose of this activity is to design and implement a PWM based circuit using IC 555.

2. Steps performed in this activity (Explain in 5 - 6 lines)

1) Simulate the PWM frequency IC555 based PWM circuit.
2) Test on Bread Board.
3) Build & test the circuit on PCB.

3. What resources / materials / equipments / tools did you use for this activity ?

1. IC 555
2. Connecting wires
3. General purpose PCB
4. Resistor (1 KΩ X3)
5. DC motor, led
6. Zener diode 4148 X2
7. Capacitor
8. Pot 50 KΩ

4. What skills did you acquire ?

1. PWM Concept
2. Frequency and duty cycle function.
3. selection of Components.
4. Design.
5. Implementation.
6. Testing
7. Debugging.
8.

5. Time taken to complete the activity ? 1 Hour. (hours)

(Signature)
Instructor

(Signature)
Student

(To be filled by Instructor)

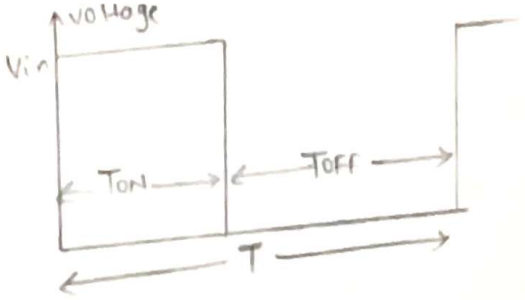
Sr. No.	Skills / Competencies	Achieved / Not Achieved (YES / NO)
1)	PWM Concept.	
2)	Frequency and duty cycle function.	
3)	Selection of Components.	Y
4)	Design.	
5)	Implementation.	
6)	Testing.	
7)	Debugging.	

Remarks

Total marks 09 out of 10.

Sign of Instructor

Date: 18/11/



$T = T_{ON} + T_{OFF}$

% Duty Cycle $= T_{ON}/T \times 100$

V_{out} = % Duty Cycle $\times V_{in}$

Q.1) For automotive System, the input voltage is observed to be 24V. The frequency of operation is observed to be 1KHz & $T_{ON} = 2 \times T_{OFF}$. Find a) T b) T_{ON} c) T_{OFF} d) % Duty Cycle e) V_{out}.

→ a) $T = 1/F = 1/1 \times 10^3 = 1 \times 10^{-3} = 1ms$

c) $T = T_{ON} + T_{OFF} \Rightarrow T = 2 \times T_{OFF} + T_{OFF} = 3\,T_{OFF} \Rightarrow T_{OFF} = \frac{1 \times 10^{-3}}{3}$

$T_{OFF} = 0.333 \times 10^{-3} \Rightarrow T_{OFF} = 0.333ms$

b) $T = T_{ON} + T_{OFF} \Rightarrow T_{ON} = 1 \times 10^{-3} = 0.333 \times 10^{-3} = 0.6667 \times 10^{-3} ms$

$T_{ON} = 0.6667 ms$

d) % Duty Cycle $= T_{ON}/T \times 100 = \frac{0.6667 \times 10^{-3}}{1 \times 10^{-3}} \times 100 = 66.67\%$.

e) V_{out} = % Duty Cycle $\times V_{in} = \frac{66.67}{100} \times 24 = 16.0008\,V$

Q.2) $V_{in} = 12V$ $T_{ON} = 20ms$ $T_{OFF} = T_{ON}/4$. Find T, F, % Duty Cycle, V_{out}. Draw PWM waveform for the same.

→ $T = T_{ON} + T_{OFF} = T_{ON} + T_{ON}/4 = 20 \times 10^{-3} + \frac{20 \times 10^{-3}}{4} = 0.025sec = 25ms$

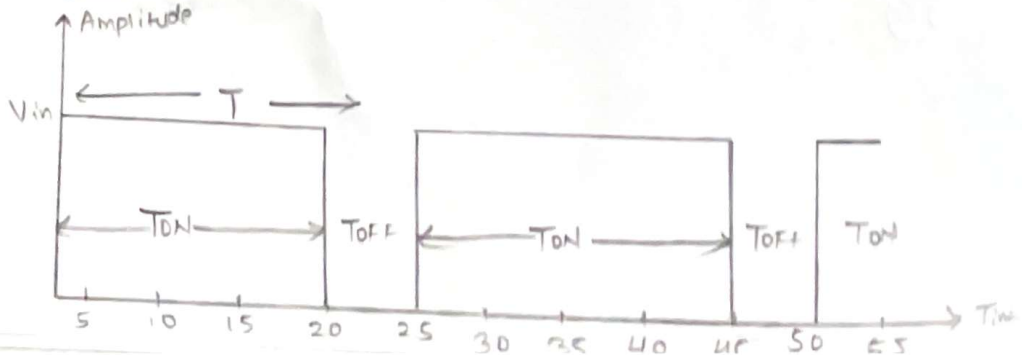
$F = 1/T = 1/25 \times 10^{-3} = 40Hz$.

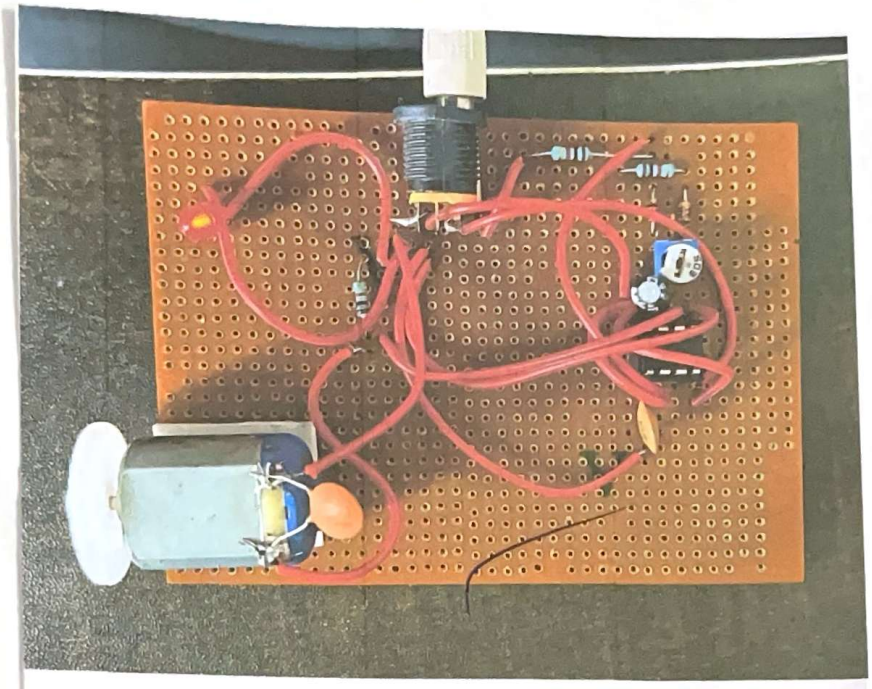
% Duty Cycle $= \frac{T_{ON}}{T} \times 100 = \frac{20 \times 10^{-3}}{25 \times 10^{-3}} \times 100 = 80\%$.

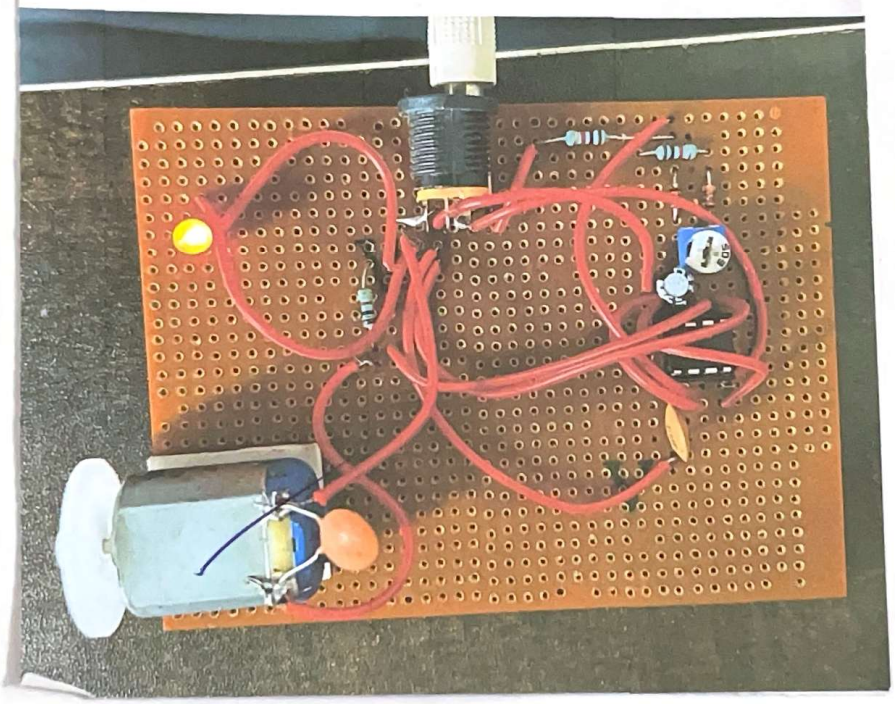
V_{out} = % Duty Cycle $\times V_{in}$

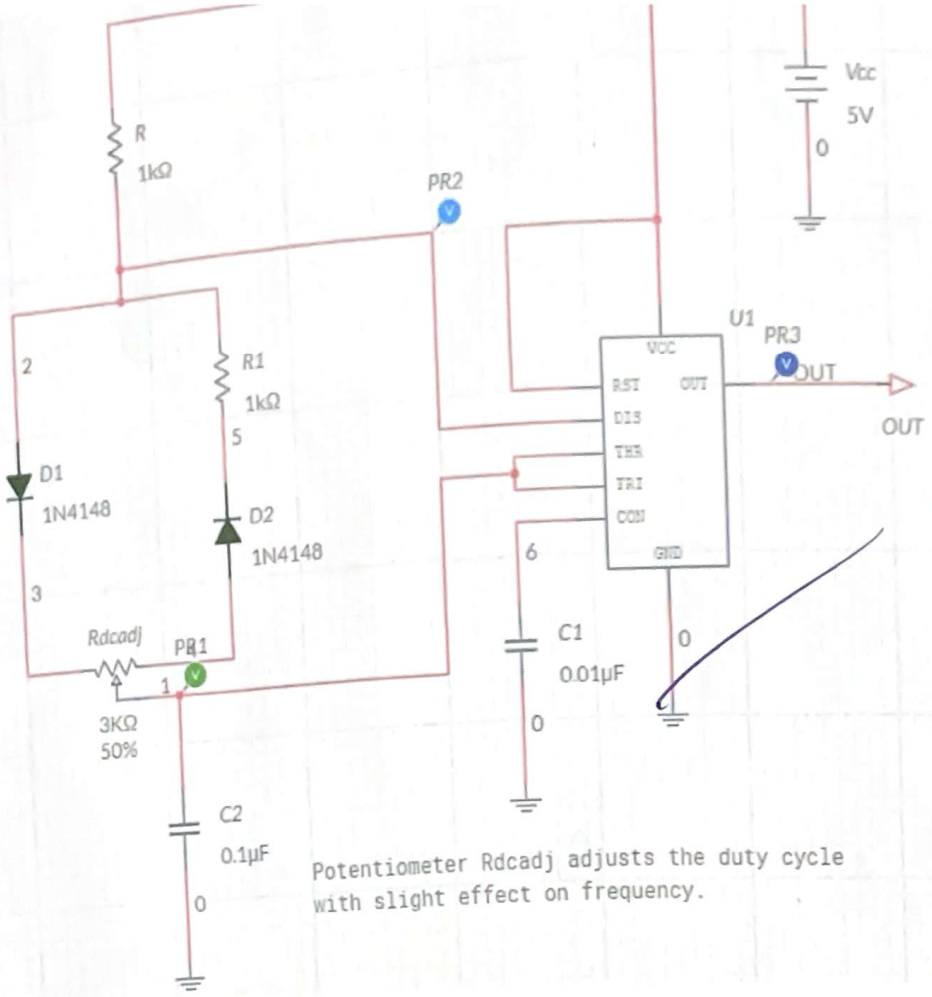
$= \frac{80 \times 12}{100}$

$= 9.6V$

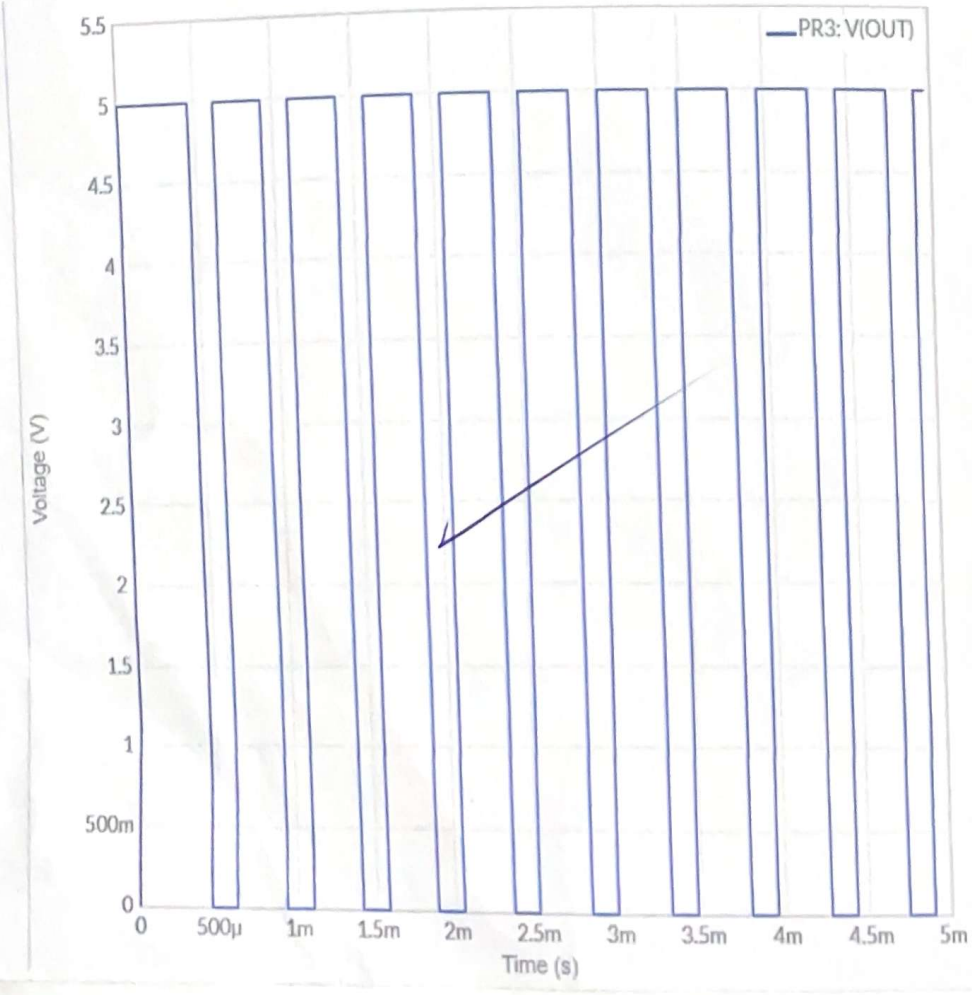








Potentiometer Rdcadj adjusts the duty cycle with slight effect on frequency.



SKILL ACTIVITY NO: 5

Date : 4/11/24

(To be filled by the Instructor)

Title : Survey and analysis of various categories of wires and fuses commonly used in vehicles. (5 A ATO Type Fuse and 6 gauge wire).

Skills / competenies to be acquired :

1. Types of wires
2. Colour coding of wires
3. Power handling Capacity
4. Gauge of wire.
5. Type of fuses
6. Ratings of fuses
7. Categories based on colour coding
8.

Duration of activity (hours) : 1 Hr.

(To be filled by the Student)

1. What is the purpose of this activity ? (Explain in 3 - 4 lines)

The main purpose of this activity is surveying and analysis of various categories of wires and fuses commonly used in vehicles.

2. Steps performed in this activity (Explain in 5 - 6 lines)

1) Select a Type of fuse and wire.
2) Visit a nearby shop and purchase the give component.
3) Note down the name of wire and fuse.
4) Note rating of fuse.
5) Note down Gauge of wire.

3. What resources / materials / equipments / tools did you use for this activity ?

1. 5 A ATO Type fuse.
2. 6 gauge wire.
3.
4.
5.
6.
7.
8.

4. What skills did you acquire ?

1. Types of wires
2. Colour coding of the wires
3. Power Handling capacity.
4. Gauge of wire.
5. Types of fuses
6. Ratings of fuses
7. Categories based on colour coding
8.

5. Time taken to complete the activity ? 1 (hours)

(Signature)
Instructor

(Signature)
Student

(To be filled by Instructor)

Sr. No.	Skills / Competencies	Achieved / Not Achieved (YES / NO)
1)	Types of wires.	
2)	Colour Coding of wires.	
3)	Power Handling Capacity.	
4)	Gauge of wire.	
5)	Types of fuses.	
6)	Ratings of fuses.	
7)	Categories based on colour coding.	

Remarks

Total marks 09 out of 10.

Sign of Instructor
Date: 18/11

* Fuse *

1) Name of Fuse :- 5 A ATO Type Fuse.

2) Market Name of Fuse :- ATO Type Fuse

3) Rating of Fuse :- 5 Ampere.

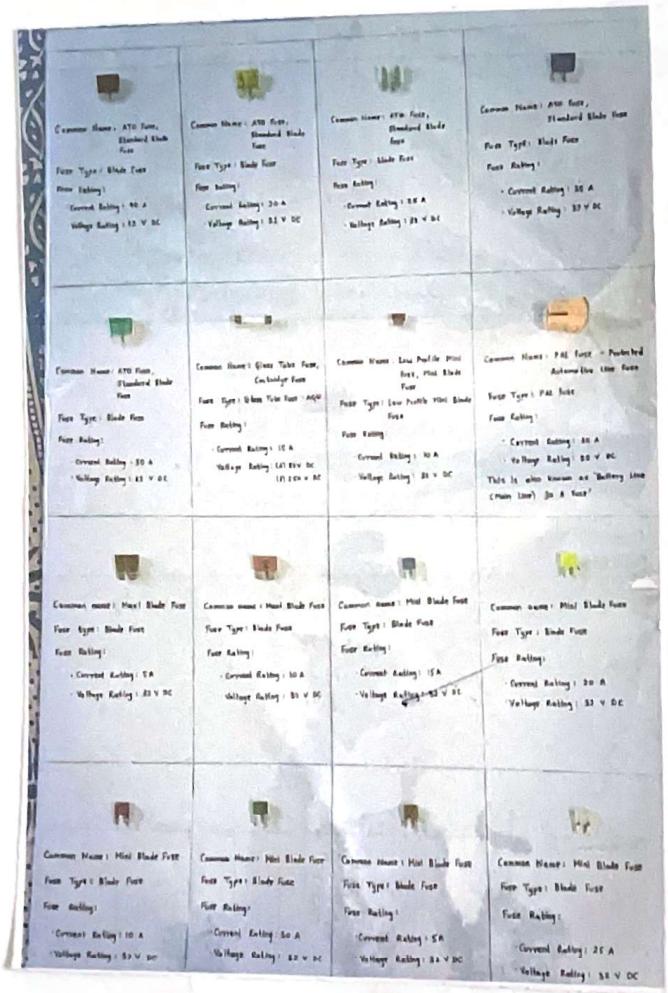
4) Type of Fuse :- ATO Type.

* Wire *

1) Name of Wire :- 6 gauge wire.

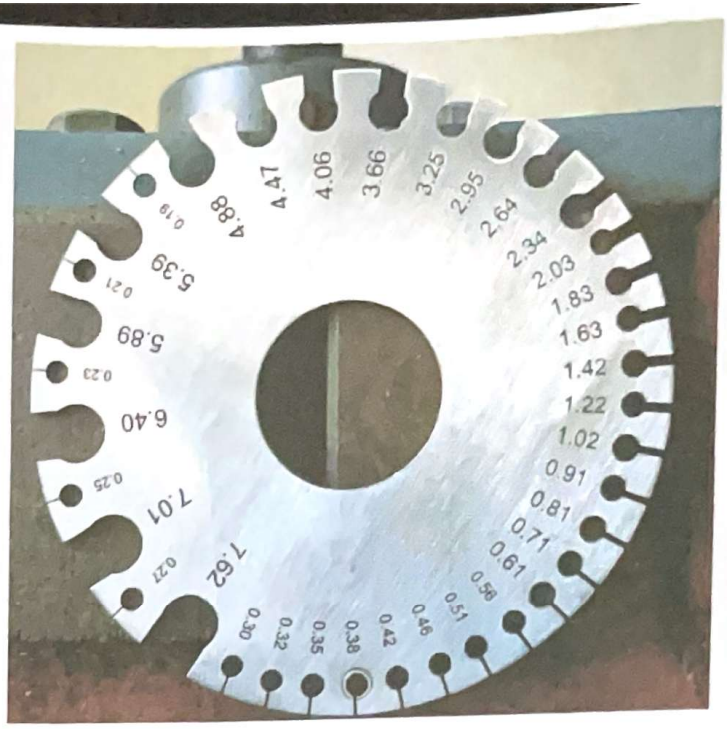
2) Market Name :- 6 gauge wire.

3) Rating of wire :- 6 gauge.



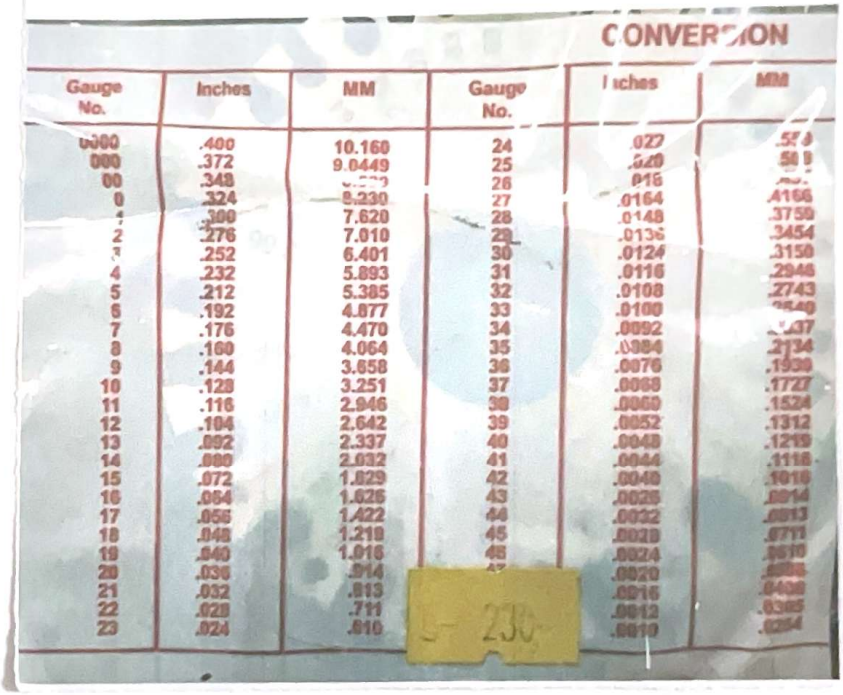
* Types of Fuse *

1) Micro 2 Fuse.
2) Micro 3 Fuse.
3) Low-profile mini fuse.
4) Mini Fuse.
5) ATO Fuse.
6) Maxi Fuse.



* Types of Wire *

1) Primary wire.
2) Multi-conductor jacket wire.
3) Battery cable.
4) Different type Gauge wire.



CONVERSION

Gauge No.	Inches	MM	Gauge No.	Inches	MM
0000	.400	10.160	24	.022	.57
000	.372	9.0449	25	.020	.58
00	.348	[illegible]	26	.018	[illegible]
0	.324	8.230	27	.0164	.4166
1	.300	7.620	28	.0148	.3759
2	.276	7.010	29	.0136	.3454
3	.252	6.401	30	.0124	.3150
4	.232	5.893	31	.0116	.2946
5	.212	5.385	32	.0108	.2743
6	.192	4.877	33	.0100	.2540
7	.176	4.470	34	.0092	.2337
8	.160	4.064	35	.0084	.2134
9	.144	3.658	36	.0076	.1930
10	.128	3.251	37	.0068	.1727
11	.116	2.946	38	.0060	.1524
12	.104	2.642	39	.0052	.1312
13	.092	2.337	40	.0048	.1219
14	.080	2.032	41	.0044	.1116
15	.072	1.829	42	.0040	.1016
16	.064	1.626	43	.0036	.0914
17	.056	1.422	44	.0032	.0813
18	.048	1.219	45	.0028	.0711
19	.040	1.016	46	.0024	.0610
20	.036	.914	47	.0020	.0508
21	.032	.813	48	.0016	.0406
22	.028	.711	49	.0012	.0305
23	.024	.610	50	.0010	.0254

SKILL ACTIVITY NO: 6

Date : 27/10/24

(To be filled by the Instructor)

Title : Selection of an automobile sensor/actuator for an intended automotive application. (coolant level sensor).

Skills / competenies to be acquired :

1. Requirement Analysis.
2. Electrical Specifications.
3. Mechanical Specifications.
4. Analyzing Data sheet.
5. Manufactures and their details.
6.
7.
8.

Duration of activity (hours) : 1 Hr.

(To be filled by the Student)

1. What is the purpose of this activity ? (Explain in 3 - 4 lines)

The main purpose of this activity is to select an automotive sensor / actuator for an intended automotive application.

2. Steps performed in this activity (Explain in 5 - 6 lines)

1) Decide an automotive application.
2) Decide an automotive sensor for the same.
3) Get Download the datasheet for the same.
4) List the specifications for it.
5) Compare with other sensors by the same manufacturer.

3. What resources / materials / equipments / tools did you use for this activity ?

1. Coolant level Sensor.
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

4. What skills did you acquire ?

1. Requirement analysis
2. Electrical specifications
3. Mechanical specifications
4. Analyzing data sheet
5. Manufacturer & their details.
6. _____
7. _____
8. _____

5. Time taken to complete the activity ? 1 Hr (hours)

(Signature)
Instructor

(Signature)
Student

(To be filled by Instructor)

Sr. No.	Skills / Competencies	Achieved / Not Achieved (YES / NO)
1)	Requirement analysis.	
2)	Electrical specifications.	
3)	Mechanical specifications.	
4)	Analyzing data sheet.	
5)	Manufacturers & their details.	

Remarks

Total marks 10 out of 10.

Sign of Instructor
Date: 18/11

* Applications *

1) Coolant level Sensor.
2) Fluid level sensor
3) Detects presence or absence of critical coolant fluid inside a coolant system.
4) To measure coolant level.

* Features *

1) Magnetically operated level sensor.
2) Mounted in coolant reservoir tank.
3) Normally open circuit.
4) Operates when float moves up & down with fluid level.
5) choice of circuity for output voltages.
6) Choice of connectors and terminals.

* Benifits *

1) Robust construction makes this sensor well suited to harsh environments.
2) No stand by power required.
3) Can directly interface with warning system device.

* List of Important Specifications *

1) Electrical voltage :- 200Vdc/140 Vac RMC
2) Electrical Current :- 250Vdc.
3) Electrical Rating :- 0.5Adc/0.35Aac RMS.
4) Electrical resistance :- 0.1 Ω to 10^{10} Ω.
5) Electrical Capacitance :- 0.3pF

1) Mechanical temperature :- -40° to +125°
2) Mechanical shock :- 100g.
3) Mechanical Vibration :- 30g.

* Working Principle *

The sensor is in a normally open position. When the fluid level in the reservior tank is low, the magnet in the float activates the Reed switch sending a voltage output to the customer electrical & Interface.

Littelfuse
Expertise Applied | Answers Delivered

Automotive Sensor Products

Coolant Level Sensor – Reed

Features

- Magnetically operated level sensor
- Mounted in coolant reservoir tank
- Normally open circuit
- Operates when float moves up and down with fluid level
- Choice of circuitry for output voltages
- Choice of connectors and terminals

Benefits

- Robust construction makes this sensor well suited to harsh environments
- No standby power required
- Can directly interface with warning system device

General Description

When paired with a float magnet, Reed Sensors can function as fluid-level sensors. A float level sensor is used to detect the coolant level inside the reservoir tank.

Applications

- Coolant level sensor
- Fluid level sensor

Operation

Basic Principle
The sensor is in a normally open position. When the fluid level in the reservoir tank is low, the magnet in the float activates the Reed Switch sending a voltage output to the customer electrical interface.

Packaging Options
Custom packaging can be provided to meet any need, please contact Littelfuse Engineering for details.

Functional Characteristics

Parameter			
Type			
Reed Switch Sensor			
Contact			Normally Open
Electrical			
Voltage	Switching	Max.	$200V_{dc}$ / $140V_{ac}$ RMS
	Breakdown	Min.	250 V_{dc}
Current	Switching	Max.	$0.5A_{dc}$ / $0.35A_{ac}$ RMS
	Carry	Max.	$0.8A_{dc}$ / $0.35A_{ac}$ RMS
Rating	Power	Max.	10W
Resistance	Contact, Initial	Max.	0.1 Ω
	Insulation	Max.	$10^{10}\Omega$
Capacitance	Contact	Typ.	0.3pF
Environmental/Mechanical			
Temperature	Operating	Celsius	-40° to +125°
	Storage	Celsius	-40° to 125°
Shock	11ms ½ Sine	Max.	100g
Vibration	50 – 2000Hz	Max.	30g

Littelfuse

Website: www.littelfuse.com
Sales Support: ALL_Autosensors_Sales@littelfuse.com
Technical Support: ALL_Autosensors_Tech@littelfuse.com

* Working of Speed Sensor Principal

The speed sensor works by using a magnetic field and a coil. As a toothed gear rotates near the sensor, the teeth disrupt the magnetic field, inducing voltage pulses in the coil. The pulse frequency corresponds to the rotation speed, which is used to calculate the vehicle's speed.

* Important Specification of the sensor

Operating Power Input (Voltage) : Min → 4V Max → 24V

Max Power Input → 26V

Magnetic Switching Range → 40–100mT

Operating air gap → 0.5mm – 3.0mm

Accuracy [with Littelfuse Target] → 1–2 %

Operating temperature → -40°C to +150°C

Storage Temperature → -65°C to 150°C

* Application

① Cam shaft speed and timing detection

② Engine speed

③ Crank shaft speed and timing detection

* Manufacturers

① BCH Electric Ltd

② ifm electronic

③ Allegro Micro Systems

④ Honeywell

⑤ Turk India Automation PVt. Ltd

⑥ Littelfuse

Automotive Sensor Products

Engine Speed/Position Sensor

Features

- Magnetic target sensing
- Simple flush and recessed mounting options available
- Internal circuit protection available
- EMC/ESD protection available
- Choice of circuitry for outputs
- Choice of connectors and terminals

Benefits

- Robust construction makes this sensor well suited to harsh environments
- Hermetically sealed, magnetically operated non-contact sensing gives excellent life and reliability
- High accuracy

General Description

The speed sensor measures gear or target wheel speed and position. The Engine Control Module can use this information to modify various engine functions such as Air/Fuel Ratio, ignition timing and perform diagnostic tests.

Applications

- Cam shaft speed and timing detection
- Engine speed
- Crank shaft speed and timing detection

Operation

Basic Principle

Hall Effect sensors operate on the change in an external magnetic field which results in a change in the output voltage of the sensor. Camshaft and Crank shaft sensors typically map a tooth or notch into a unique signal for ECM use.

Packaging Options

Custom packaging can be provided to meet any need, please contact Littelfuse Engineering for details.

Functional Characteristics

Parameter			
Type			
Speed and Speed with Direction Sensor			
Ferrous Wheel Detection			
Electrical			
Operating Power Input	Voltage	Min-Max.	4 – 24 V
Max Power Input	Voltage	Max.	26 V
Power On Time	ms	Typical	0.5-1 ms
Magnetic Switching Range	mT	Min-Max.	40 – 100 mT
Operating Air Gap	MM	Min-Max.	0.5 -3.0
Duty Cycle Variation (Direction Sensor)			+/- 10%
Relative Timing Accuracy (with Littelfuse target)		Max.	+/- 0.4°
Accuracy (with Littelfuse Target)		Max.	+/- 1-2%
Environmental/Mechanical			
Temperature	Operating	Celsius	-40° to +150°
	Storage	Celsius	-65° to 150°
Shock	11ms ½ Sine	Max.	100g
Vibration	20 – 2000Hz	Max.	30g
Sealing	IP6K7K Standard		Available Up to IP6K9K
Connections Available	Pigtail or Integrated		Molex, Delphi, TE, and many more

Custom electrical and environmental specifications can be designed to meet any need, please contact Littelfuse Engineering for details.

Littelfuse

Website: www.littelfuse.com
Sales Support: ALL_Autosensors_Sales@littelfuse.com
Technical Support: ALL_Autosensors_Tech@littelfuse.com

ASP-MKT45-0022-AA

SKILL ACTIVITY NO: 7 Date : 8/11/24

(To be filled by the Instructor)

Title : To apply the CAN BUS Protocol in vehicle Lighting System.

Skills / competenies to be acquired :

1. To ... bus Protocol. 5. ____

* Application of the Rain Sensor:

1] Automatic Wipers

2] Automatic air conditioning (for windsheild).

2] Requirement criteria:

1] Placement and mounting

2] Elebical compatibity.

3) sensor Technology

4) Wipes system integration

5) Enviromental Durability

3] Manufactures:

1] Bosch

2) Denso corporation

3) valeo

4) HELLA

5) Continental AG

6) ZF Friedchshafen (AG (TRW Automative).

3) Working Principle:

• A rain sensor works using infared (IR) technology. It emits IR light onto the windsheild from inside the car. When the glass is dry, most of the light is reflected back to the sensor. when rain droplets are present, the light is scattered, reducing the reflection. The sensor detects this change in light intensity and activites the windsheild wipers automatically, adjusting their speed based on the amount of rain detected

Theoretically, following its re-entry 1st and 2nd wiper

4) List of important Specs.

i] Part number:- 1 397 212 606

ii] Glass Thickness (Permissible) 5mm ± 1mm

iii] Windsheild Curvature Radius (Permissible) 2mm .. 6mm

iv] Light wavelength 565nm

v] Op erating voltage 10v.....16v

vi] Ripple, permisible ± 0.7v

vii] frequency range 100Hz ...700Hz

SKILL ACTIVITY NO: 7 Date : 8/11/24

(To be filled by the Instructor)

Title : To apply the CAN BUS Protocol In vehicle Lighting System.

Skills / competenies to be acquired :

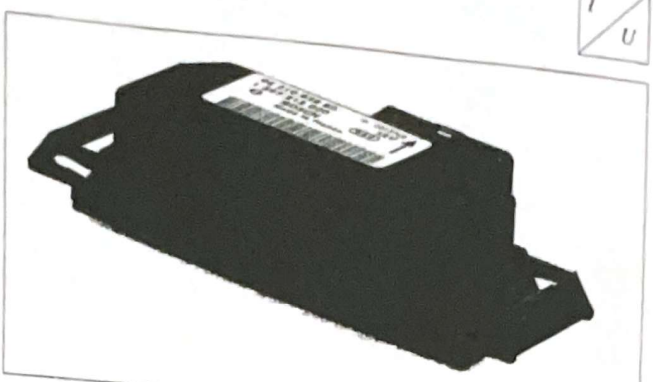
1. To [illegible] Protocol. 5. _____

_____

Rain sensors

BOSCH

- Recognises rain on the windshield
- Differentiates between water drops, water splash, streaks, and dirt
- For integration in the windshield-wiper system
- Safety function in case of defects
- Improvement of passive safety in the vehicle



I / U

Application
For detecting a wet windshield (rain drops etc.) when the wiper system is in the automatic mode.

Design and function
The rain sensor is attached to the inside of the vehicle's windshield within the wiped area. If the windshield system is switched to automatic mode and drops of water fall on the windshield glass in the area covered by the sensor, this triggers a wiping cycle. The sensor's operation is based on an optical principle: A beam of light of known intensity is directed through a defined length of a sheet of glass by repeated total reflection within the glass. At a given point, optical decoupling is applied to deflect it out of the glass and into a measuring system where the residual light intensity is measured.
If there are water drops on the surface of the windshield, a portion of the light beam is not totally reflected, and emerges from the glass as a result. The resulting loss of light intensity is a measure of how much rain is falling on the windshield. The rain sensor and evaluation electronics are contained in a special housing which is clipped into clamps which are glued to the windshield.
A transmit diode and a receive diode, each together with two optical fibers and two silicone coupling pads (on the windshield side), form an optical measuring circuit. There is a heating area between the optical-fiber exit points so that the measurement cannot be falsified by misting-up of the inside of the windshield. The optical fibers are made of plastic which is resistant to both temperature and ageing.
The light leaving the transmit diode is focussed at the input lens of the first light guide and diverted at totally reflective surfaces so that at its point of exit it can enter the windshield at a defined angle, and in the form of a practically parallel light beam, through one of the snugly positioned silicon pads. Theoretically, following its re-entry into the windshield glass, the light beam is totally reflected in the glass 4 times on the outside and 3 times on the inside, after which it enters the sensor again through the second silicone pad.
The width of the light beam, and its penetration angle, provide an adequately homogenous distribution of the reflection points on the outside surface of the windshield, and therefore ensure relatively uniform sensitivity over the whole of the measuring surface.
The second light guide is identical to the first one. The surface at its light exit surface is also slightly curved in the form of a lens. The residual light arriving here is projected onto a photodiode sensor surface by means of an optical aperture. The amount of light received by the diode changes depending upon the degree of windshield wetting. Finally, this photodiode's output signal is conditioned and passed to the microprocessor's A/D converter.
There are two further variables which serve as inputs to the sensor in addition to the optically registered degree of wetting. These are the position of the windshield-wiper lever and the signal from the wiper-motor control cam. The sensor output is used to trigger two relays which switch the 1st and 2nd wiper-motor speeds.

Technical data / Range

Part number	1 397 212 000
Glass thickness, permissible	5 mm ± 1 mm
Windshield curvature radius, permissible	2 m ... 6 m
Measuring surface, approx.	400 mm²
Light wavelength	565 nm
Electrical data[1]	
Operating voltage	10 V ... 16 V
Ripple, permissible	± 0.7 V
Frequency range	100 Hz ... 700 Hz
Limit data	
Operating voltage	
For a period of 1 min	24 V
For a period of 2 h	18 V

[1]) The electrical part of the sensor is located on 2 pcb's in the sensor housing.

Accessories

Mating connector, 11-pole	AMP-No. 142 704-1

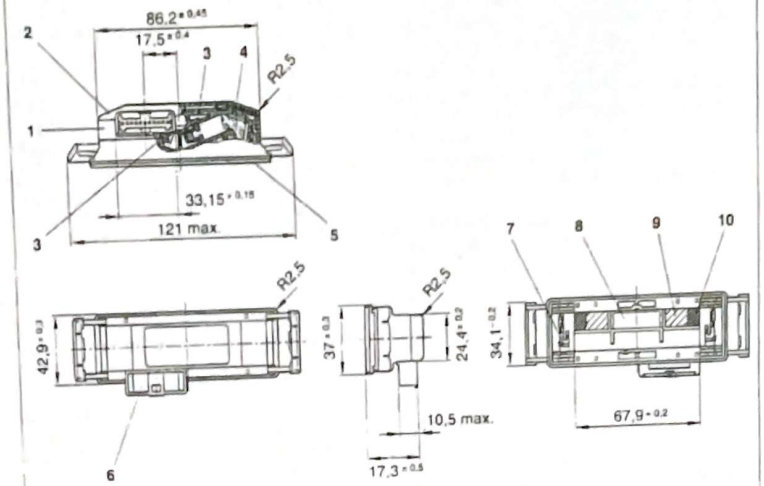
To be ordered from
AMP Deutschland GmbH,
Amperestr. 7–11, D-63225 Langen,
Tel. 0 61 03/70 90.
Details of fastening clips and special adhesive upon request.

Explanation of symbols:
I Beam strength, intensity

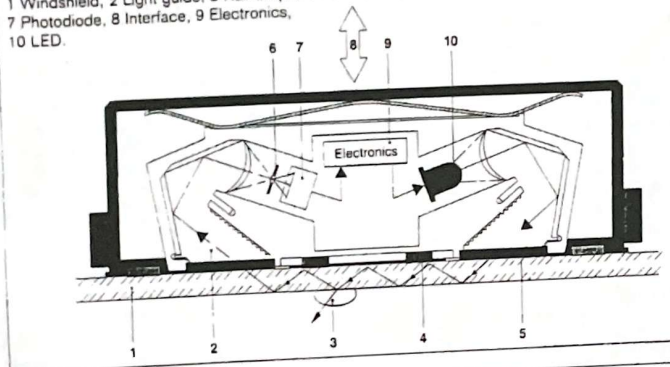
Skills / competenies to be acquired :

1. To ... Protocol. 5. ...

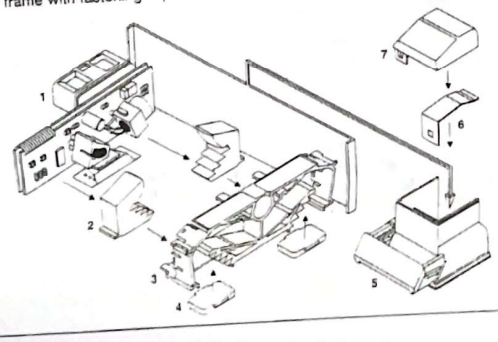
Dimension drawings
1 Retaining frame, 2 Cover plate, 3 Retaining element, 4 Leaf spring, 5 Gasket, 6 Plug to fit mating connector AMP, No. 142 704-1, 7 Heating plate, 8 Light guide, 9 Optocoupler, 10 pcb.



Rain sensor (sectional drawing)
1 Windshield, 2 Light guide, 3 Raindrops, 4 Heater, 5 Optical coupling, 6 Optical aperture, 7 Photodiode, 8 Interface, 9 Electronics, 10 LED.



Rain sensor (components)
1 pcb with heater plate, 2 LED mount and plug, 3 Housing interior, 4 Silicone pads, 5 Retaining frame with fastening clips, 6 Leaf spring, 7 Cover plate.



Optical values: The sensor-measuring surface is that strip between the injection point and the decoupling point and approx. 2/3 of the surface of the silicone pads. An LED with a light wavelength in the visible range (green) is used.

Incorporating the rain sensor in the windshield-wiper system

Together with the wiper motor and the steering-column switch, the rain sensor is an integral part of the windshield-wiper installation. Whereby, with the exception of wiping stage 1, the sensor assumes the control of the wiper motor.
The complete wiper system can carry out the following functions:
- Stage 1 wiping (slow wiping),
- Stage 2 wiping (rapid wiping),
- Brief wiping,
- Afterwipe when washer in operation (wipe/wash),
- Automatic control using rain sensor (automatic mode).

Switch position "Stage 1": Via the control stalk and wiper relay 1, the wiper motor is switched to wiping stage 1.
Switch position "Stage 2": Via wiper relay 1 and changeover relay 2, the wiper motor is switched to wiping stage 2. If the wiper is switched back by hand to OFF from wiping stage 2, the wiper motor in wiping stage 1 shifts to the park position.
Switch position "Brief wiping": The windshield-washer pump is operated directly by a pushbutton, and the wiper motor triggered by the relay. Three afterwipe cycles take place after releasing the pushbutton.
Switch position "Automatic mode": The rain sensor is responsible for triggering both the relays for the wiper motor as a function of the degree of wetting of the windshield.
Self-calibration of the sensitivity is performed in this mode. The sensor is able to distinguish between splash water, windshield streaking, and dirt.

(To be filled by the Instructor)

Title : To apply the CAN BUS Protocol in vehicle Lighting System.

Skills / competenies to be acquired :

1. To ... Protocol. 5. ...

Rain sensors (contd.)

Switch-on conditions
The rain sensor's heater is switched on when the ignition key is turned to "Radio" or "Ignition ON" (Term. 15). At the same time, the control-stalk switch must also be turned to the "Automatic mode" setting in order for the rain sensor to be in the active mode. If the control-stalk switch is already turned to "Automatic" when the ignition switch is turned to "Ignition ON", the control-stalk switch must shifted to either "Stage 1" or "Neutral" position, and then back again to "Automatic", in order for the rain sensor to switch to the active mode. If the ignition is switched off, or even interrupted briefly, the rain sensor does not switch to the active mode of its own accord.

Initialization of the rain sensor
The first time "Automatic mode" is switched on, the rain sensor switches to the active mode. This immediately triggers a wiping cycle which serves to generate a reference value for the electronic circuitry, which takes into account the prevailing conditions at that moment such as windshield tint, basic-light loss, degree of wetting, dirt, etc.
The optimal setting can shift due to warm-up. After 1 minute, therefore, it is necessary to correct the amplification of the received light signal in the direct mode.

Triggering
In order to trigger a wiping process, the measured signal must be compared with the reference signal. But since the reference value is not a constant, but is dependent upon the particular situation, triggering takes place according to the following two criteria:
1. The difference between the particular measured value of the sensor and the reference value is applied as a triggering threshold. This difference is a measure of the degree of windshield wetting.
2. The rate of rise of the signal and the signal characteristic as a function of time are taken as the measure for raindrop detection.

Automatic mode
Here, four different operating modes are provided:
1. When Automatic mode is switched on, and a dry windshield has been detected, the sensor switches to its basic mode (direct mode, wiping speed 1). Every time rain appears on the windshield, this directly triggers a single wiping cycle, in the course of which a decision is reached as to whether wiping is to continue in Stage 1, or whether no further wiping is to take place after the single wiping cycle. The amount of rain which falls in the subsequent wiping pause is used to determine the interval to the next direct-triggered wiping cycle.
2. As soon as the sensor detects a given amount of rainfall in the wiping pause, it switches over to the interval mode (stage 1 wiping speed). This is the case when an interval is calculated which exceeds the maximum possible interval (the interval is defined as the period of time in which the wiper remains parked). A wiping cycle is triggered as soon as this period has expired. The wetting is then measured again and a new interval calculated as necessary. Permissible intervals: 0.5 ... 5.0 s.
3. Continuous operation at wiping speed 1.
4. Continuous operation at wiping speed 2.

Changeover conditions
– Depending upon what is happening at the measuring surface, every other mode can be switched to directly from the direct mode.
– In order to switch to the interval mode, two successive delays until a new wipe event must have expired (within the permissible intervals). The mean value of the delay times serves as the output value for interval operation.
– Depending upon what is happening at the measuring surface, the switch-over can be made from the interval mode to either of the permanent wiping speeds, provided the calculated amount of rainfall exceeds a given threshold for event value or for event change.
– In the permanent wiping stages 1 and 2, the amount of rainfall is continuously measured and evaluated in order that the a higher or lower stage can be switched to as necessary. Erratic back-and-forth switching is avoided by a dynamic hysteresis function which depends upon the events of the last 5 wiping cycles.
– When the direct mode is switched to from either Stage 1 or 2 (when the rain suddenly stops), the system carries out a maximum of 4 (or 3) wiping cycles at the speed in question. The driver must switch through Stage 1 when switching back from Stage 2 to the direct mode.
– Switching back from the interval mode to the direct mode: If no rain is detected during the wiping pause, the interval is automatically increased in 3 steps until the maximum interval time is exceeded.
Step 1: The old interval time is repeated,
Step 2: The old interval time is increased by 25 %,
Step 3: The new interval time is increased by 50 %.
If the maximum interval time is not reached following these 3 wiping cycles, and no rain has been registered, the system switches back to the direct mode. If rain is detected in the switch-back period though, the system remains in the interval mode.

Water-splash detection
In the interval mode, sudden, marked changes in the degree of wetting (steep-front signal collapse) can lead to the triggering of a Stage 2 wiping cycle. The system then returns to the initial status.

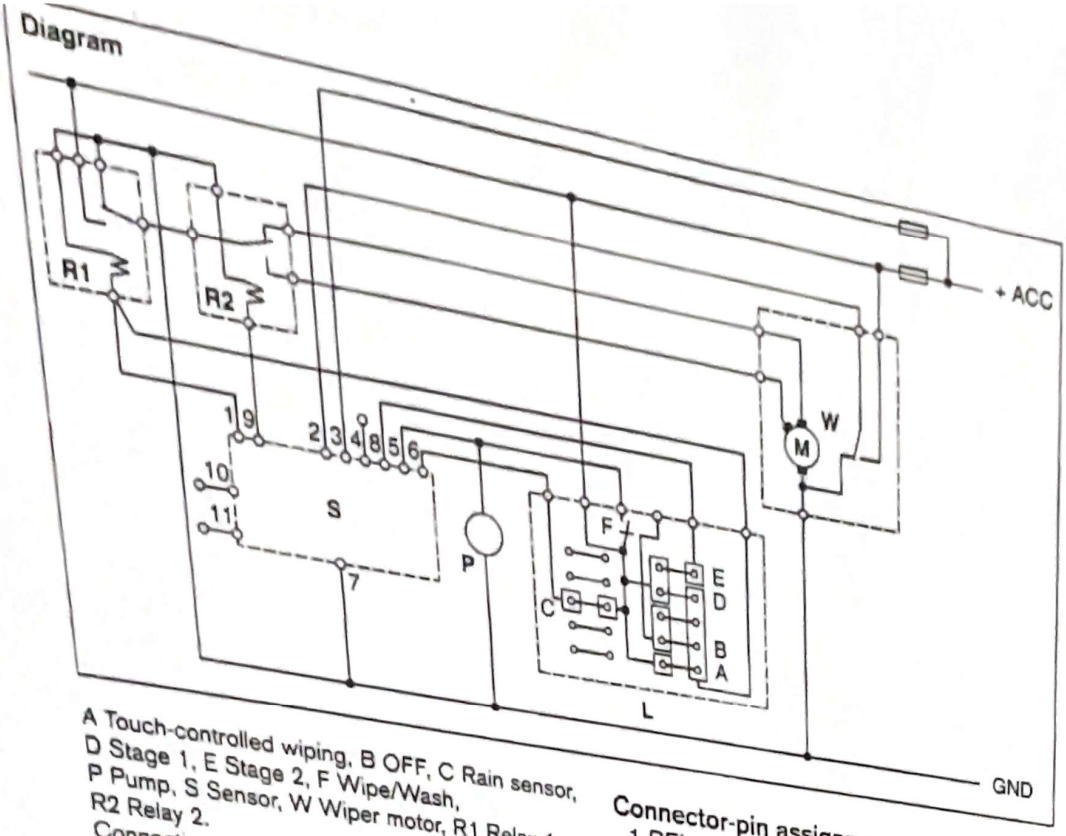
Windshield-streaking detection
A streak on the windshield is comprised of a multitude of extremely fine water droplets which dry off more or less quickly. In the direct and interval modes, streaking is detected if the sensor signal indicates that the degree of wetting is decreasing. In this case, in order to prevent unnecessary wiping when there are streaks on the windshield, detection as a function of the signal differential is suppressed, and there remains only the raindrop detection as a function of the signal shape. Differential evaluation becomes active again as soon as the sensor registers wetting or raindrops.

Dirt detection
The rain sensor recognises a dirty windshield, because in contrast to a wet windshield there is no improvement in visibility after the wiper blade has wiped the glass. In this case, the reference value automatically adapts itself to the new situation to prevent the rewipe of the dirty windshield. The reference value adapts again as soon as the windshield is clean.

Safety function
– Glass breakage: If the sensor cannot receive a signal, due for instance to a crack in the vicinity of the sensor area, the system automatically switches to a fixed interval of 4.5 s.
– Electronics failure: In this case, the system guarantees an emergency wiping function in which relay 1 for wiping stage 1 is directly controlled by the control-stalk switch (hardware bypass). This bypass ensures that the protective electronic switch-off remains ineffective in Stage 1 so that the wiper arm cannot self-park.

Blocking protection
In each control-stalk setting, apart from Stage 1, wiper-motor blockage is detected due to the fact that the NPS signal edge is missing. In order to provide protection for the motor, following a delay of 12 secs, relay 1 is clocked as per the following cycle: 2 secs voltage applied, 12 secs pause, 2 secs voltage applied, etc.

Diagram



A Touch-controlled wiping, B OFF, C Rain sensor, D Stage 1, E Stage 2, F Wipe/Wash, P Pump, S Sensor, W Wiper motor, R1 Relay 1, R2 Relay 2.

Connections:

+ ACC	Position "Radio"
GND	Ground

Connector-pin assignment

1	REL1	Switch-on relay
2	NPS	Wiper-motor control cam
3	ACC	Position "Radio"
4	–	Vacant
5	WW	Steering-column switch
6	INT	Steering-column switch, interval
7	GND	Ground
8	ST2	Steering-column switch, Stage 2
9	REL2	Stage 1/Stage 2 relay
10	TX	Test
11	–	Vacant

Note

Even without the windshield being wet, a fraction of the light flux is lost naturally on its way from transmitter to receiver. The system compensates for these losses by performing a special calibration upon switch-on. The fact that the silicone pads are "snuggly" fitted to the windshield is of major importance for the sensor's function and reliability, both when the system is installed and also during subsequent in-the-field operation. Changes to the interface surfaces caused by vibration have the same effect as the signal changes caused by raindrops. A selection of appropriate wiper motors with control cam can be found in the "Electric Motor" catalog, and a description of the relays used in the Catalog "Relays, Tractive Magnets" (Part No.: 0 332 209 150).

SKILL ACTIVITY NO: 7

Date : 8/11/24

(To be filled by the Instructor)

Title : To apply the CAN BUS Protocol in vehicle Lighting System.

Skills / competenies to be acquired :

1. To understand CAN BUS Protocol.
2. To understand vehicle lighting system.
3. To apply CAN BUS Protocol.
4. CAN Frame Format.
5.
6.
7.
8.

Duration of activity (hours) : 1 Hour.

(To be filled by the Student)

1. What is the purpose of this activity ? (Explain in 3 - 4 lines)

The main purpose of this activity is to understand the features of CAN, to understand the CAN BUS frame format, to understand vehicles lighting system.

2. Steps performed in this activity (Explain in 5 - 6 lines)

1) Connect the LN card and LN setup as given.
2) Follow the instructions as given in the LN course.
3) Check and verify the output.

3. What resources / materials / equipments / tools did you use for this activity ?

1. LN labsoft software
2. LN Cards
3. LH CAN Board
4. LN Interface
5. LN Expertmenter
6. _____
7. _____
8. _____

4. What skills did you acquire ?

1. To understand CAN Bus Protocol.
2. To understand vehicle lighting System.
3. To understand features of CAN.
4. To understand CAN Monitor.
5. _____
6. _____
7. _____
8. _____

5. Time taken to complete the activity ? 1 (hours)

(Signature)
Instructor

(Signature)
Student

(To be filled by Instructor)

Sr. No.	Skills / Competencies	Achieved / Not Achieved (YES / NO)
1)	To understand CAN BUS Protocol.	
2)	To understand vehicle lighting System.	Y
3)	To understand features of CAN.	
4)	To understand CAN Monitor.	

Remarks

Total marks 09 out of 10.

Sign of Instructor
Date: 18/11

To apply the CAN BUS Protocol in a vehicle lighting system:

The Lighting System on a vehicle can be controlled using the buttons on the dashboard (as given on the LN cards).

Low Beam:- CE

High Beam:- CE

The lighting system can also be sent from the CAN Monitor by giving appropriate hexadecimal codes through the LN software.

ID	RTR	DLC	Data	Description
04	0	1	00	No lights turned ON
04	0	1	01	Turn on Low beam
04	0	1	02	Turn on only High beam
04	0	1	03	Turn on both High & low beam.

Notes about the CAN Monitor:-

1) The commands for the lighting are contained in a single bytes.

2) The commands for turning ON the high beam and low beam are each encoded in single bit.

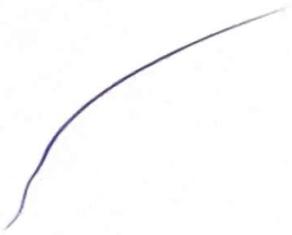
3) The bits are converted into hexadecimal & included as such in the data field (DATA) of a CAN packet.

4) If the meaning of the seprate bit is known, it is possible to send the requiste command to the CAN BUS by using the transmit function of the CAN master.

5) The command for the high & low beam settings can be generated using the buttons on the experiment card on using the transmit function of the CAN monitor. The lighting interface behaves the same in either case.

*] The operating current convert network supplies the lighting components with energy. These components operate at 12V. This voltage must be supplied by means of a seprate power supply unit. On a real vehicle, the voltage is supplied by the battery or alternator.

*] Control current circuit:- On a real vehicle, this voltage is tapped directly from the on board network and regulated to 5V, whenever necessary. The control current is just a few mA, regardless of the connected loads.



UniTrain-I: CAN bus – "Lighting interface" data matrix

Introduction

This document provides you with an extended data matrix for control of a lighting interface based on a CAN bus. The values given here refer directly to hexadecimal numbers and can therefore be input directly into the CAM monitor mask.

Data matrix

Function	ID	DLC	Payload data		
			Byte 0	Byte 1	Byte 2
Indicators (L)	2	3	25	40	80
	2	3	05	40	80
Indicators (R)	2	3	3A	40	80
	2	3	0A	40	80
Indicator (FL)	2	3	01	40	80
Indicator (FR)	2	3	02	40	80
Indicators (F)	2	3	03	40	80
Indicator (RL)	2	3	04	40	80
Indicators (FR & RL)	2	3	06	40	80
Indicators (F & RL)	2	3	07	40	80
Indicator (RR)	2	3	08	40	80
Indicators (FL & RR)	2	3	09	40	80
Indicators (F & RR)	2	3	0B	40	80
Indicators (R)	2	3	0C	40	80
Indicators (FL & R)	2	3	0D	40	80
Indicators (FR & R)	2	3	0E	40	80
Indicators (all on)	2	3	0F	40	80
Indicators (all off)	2	3	00		

Key:

L: Left
R: Right
F: Front
R: Rear

Note

Byte 1: Frequency
Byte 2: Duty cycle