

Automechanics Fourth Year

Module 4 Working Together

What this module is about

This module includes four systems namely: charging, ignition, lighting and horn systems. They have different functions in vehicle operation. You will know more about the operation of the different systems by trying out all the activities in this module. Consult your teacher if there are some doubts in interpretations. Bring your portfolio to recheck answers with your teacher.

This module aims to do the following:

1. Discuss the purpose and functions of the charging system.
2. Explain the types of charging systems.
3. Identify the parts included in the charging system.
4. Discuss the troubles of a charging system and the corresponding remedies.
5. Identify the parts of the ignition system.
6. Explain the purpose and functions of the ignition system.
7. Discuss the two circuits of the ignition system and identify their parts.
8. Describe the wiring installation of the ignition system.
9. Explain the construction of the spark plug.
10. Discuss the function of the spark plug.

PRETEST

Directions: Select the letter of the best answer to each question. Write your answer on your answer sheet.

1. It is a device that converts chemical energy to electrical energy.
 - a. armature
 - b. commutator
 - c. battery
 - d. generator

2. A device that maintains battery charge.
 - a. alternator
 - b. voltage regulator
 - c. ammeter
 - d. commutator

3. Produces alternating currents and supplies the current to the battery.
 - a. commutator
 - b. alternator
 - c. ammeter
 - d. battery

4. The alternator fails to charge and the possible causes are:
 - a. loose or slipping belt
 - b. defective regulator
 - c. worn-out fuse box
 - d. all of the above

5. A trouble in the charging system causing noisy generator.
 - a. grounded field coil
 - b. current regulator setting too high
 - c. faulty regulator assembly
 - d. dragging armature

6. A device that ignites air fuel mixture inside the combustion chamber.
 - a. electrode
 - b. diode
 - c. spark plug
 - d. ammeter

7. A device that absorbs excess current supplied by the ignition coil.
 - a. diode
 - b. condenser
 - c. spark plug
 - d. contact point

8. It provides a larger dwell period to induce the saturation of the coil.
 - a. contact point
 - b. condenser
 - c. diode
 - d. ammeter

9. It is a device that multiplies current and supplies this to the gap of the spark plug.
 - a. condenser
 - b. contact point
 - c. ignition coil
 - d. diode

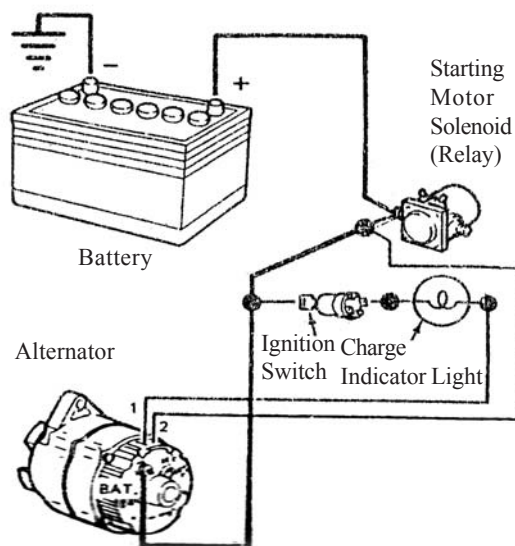
10. A kind of circuit operated through an air compressor to produce sounds.
 - a. air horn circuit
 - b. horn relay
 - c. horn switch
 - d. electric horn circuit

Lesson 1 The Charging System

The purpose and function of the charging system is to supply current to all of the lighting devices in the vehicle. Below are the different devices and parts which constitute the charging system.

1. Alternator

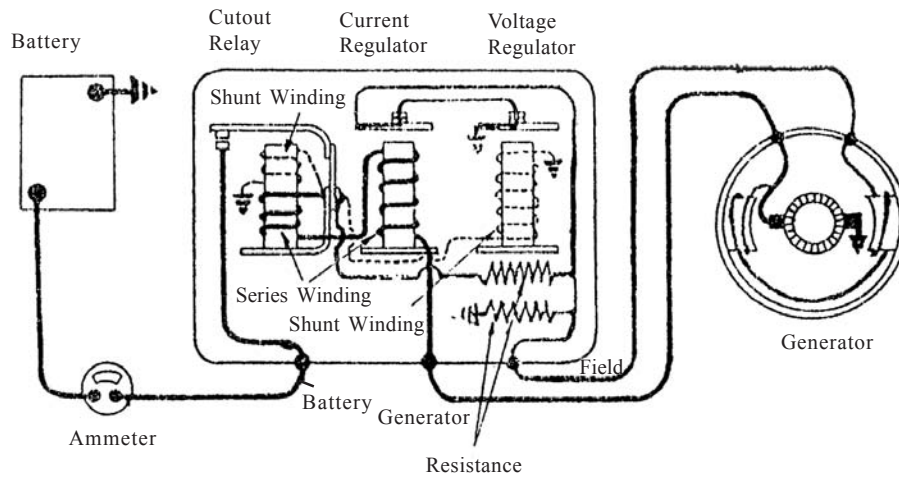
It is a device that produces alternating current and supplies this to the battery.



Alternator Assembly

2. Voltage Regulator

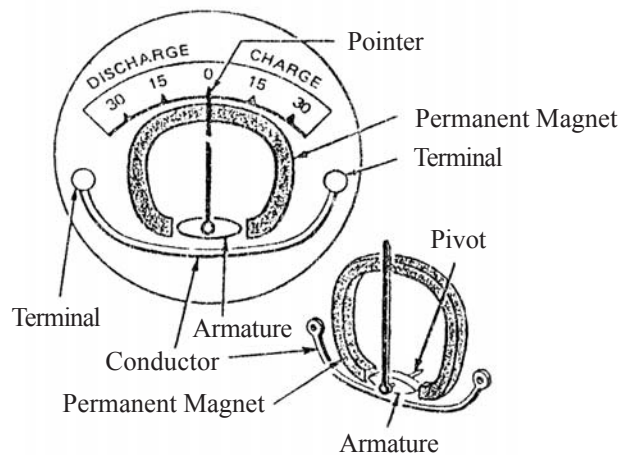
It is a device that maintains constant voltage and a fully charged battery.



Voltage Regulator

3. Ammeter

This is a device that indicates the flow of current from the alternator to the battery.



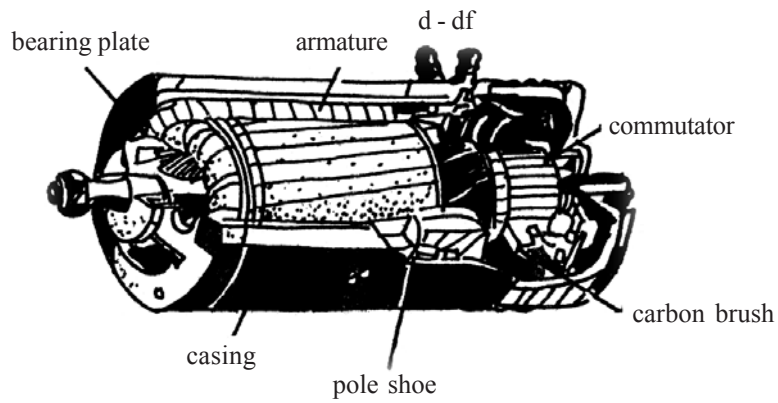
Ammeter Gauge

Types of Charging Systems

There are two types of charging systems namely: direct current and alternating current.

1. Generator

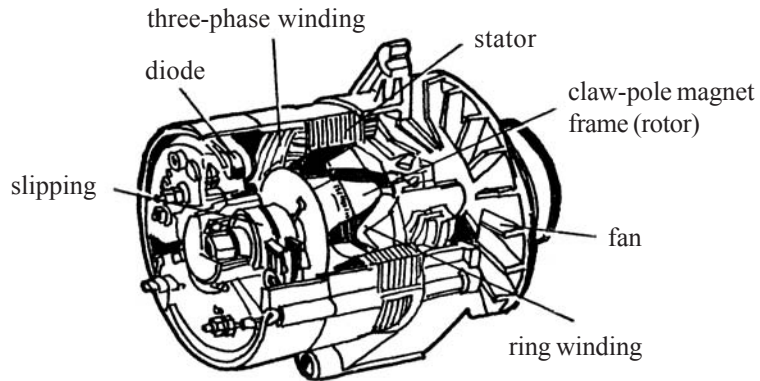
Winding is parallel to the armature that produces direct current. This type of charging equipment has been replaced today by the alternator due to traffic increase which requires the engine to run at idle speed often.



Generator Assembly

2. Alternators

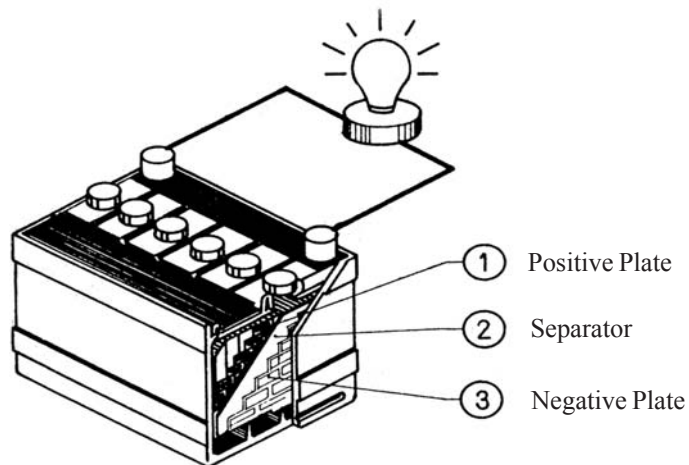
These are widely used today in automobile because of the current needed through the carbon brushes, and they require a good charging rate to the battery.

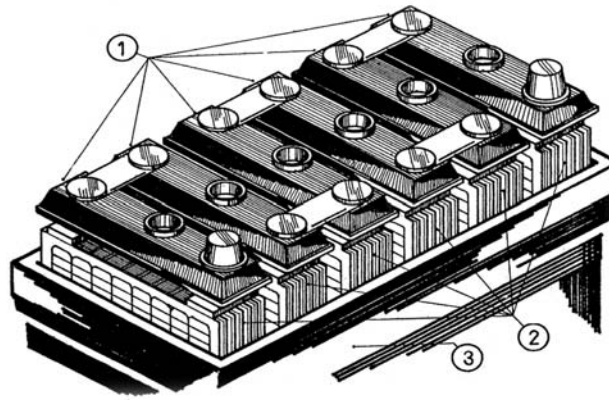


Alternator Assembly

3. Battery

It is a device that converts chemical energy to electrical energy.





12 Volt Battery

Activity 1

1. Dismantle the alternator assembly.
2. Replace the carbon brush and bushing.
3. Place a small amount of grease on the newly installed bushing.
4. Clean all the parts of the alternator assembly.
5. Check the alternator before installing the engine.

Activity 2

1. Dismantle the terminal from the battery to the alternator.
2. Disconnect the terminal of the voltage regulator and check the clearance of the cutout relay connection.
3. Rub with sandpaper to remove the ridges in the contact of a cutout relay.
4. Tighten the nut of the ammeter gauge.
5. Check the terminal of the ammeter gauge.
6. Draw and label the ammeter gauge.

Activity 3

1. Check the level of the battery solution.
2. Remove the dirt in the negative and positive terminals.
3. Check the positive terminal connected to the starter and remove the ridges.

Self-check:

- I.
 1. Did you dismantle an alternator assembly?
 2. Did you replace a carbon brush and bushing of an alternator?
 3. Did you notice a new bushing with grease as lubricant?
 4. Did you clean the parts of the alternator before you installed it in the engine?
 5. Did you check the alternator if the connection is properly installed?

6. Did you adjust the voltage regulator assembly for better charging performance?
7. Did you inspect the positive and negative terminals of the ammeter gauge?

II.

1. Did you experience dismantling the terminal of the battery to the alternator?
2. Did you check the terminal of the voltage regulator? The clearance of the cutout relay?
3. Is there any contact after removing the ridges on the cutout relay?
4. Did you tighten the nut of the ammeter gauge?
5. Did you check the terminal of the ammeter gauge?
6. Did you draw and label the parts of the ammeter gauge?

III.

1. Did you check the level of the battery solution?
2. Did you remove the dirt in the negative and positive terminal?
3. Did you check the positive terminal connected to the starter?

Lesson 2 Troubles in the Charging System, Causes and Remedies

1. The alternator or generator fails to charge

Causes	Possible Remedies
<ol style="list-style-type: none"> a. Loose, broken or slipping belt b. Loose connection and poor wiring and brush contact c. Defective regulator d. Worn-out fuse box 	<ol style="list-style-type: none"> a. Tighten or replace fan belt. b. Clean and tighten all connections. c. Replace the regulator. d. Replace the fuse box.

2. Charging rate too high or not steady

Causes	Possible Remedies
<ol style="list-style-type: none"> a. High current resistance b. Too high current regulator setting c. Grounded field coil 	<ol style="list-style-type: none"> a. Locate resistance, clean tighten or replace the wire and connections. b. Replace the unit. c. Check or correct the grounds.

3. Excessive rate of charge

Causes

- a. High circuit resistance
- b. Faulty regulator assembly

Possible Remedies

- a. Tighten the connections and check resistance.
- b. Replace the regulator assembly.

4. Noisy generator (DC)

Causes

- a. Dragging armature
- b. Dry bearing
- c. Defective bearing
- d. Belt slipping

Possible Remedies

- a. Replace the bearing/armature.
- b. Lubricate the bearing.
- c. Replace the bearing.
- d. Tighten the belt.

5. Regulator points oxidized, pitted or burned

Causes

- a. Incorrect regulator
- b. Shorted field winding
- c. Shorted condenser
- d. Air gap is incorrect
- e. Point gap is incorrect

Possible Remedies

- a. Replace the regulator and connect properly.
- b. Replace the generator.
- c. Replace the condenser.
- d. Adjust air correctly.
- e. Adjust point gap correctly.

6. Undercharged Battery

Causes

- a. No charge or low battery rate
- b. Excessive use of the starter
- c. Defective battery
- d. Excessive resistor in charging circuit

Possible Remedies

- a. Adjust the charging rate.
- b. Time the engine for fast starting.
- c. Replace the battery.
- d. Test and check resistance.

7. Overcharged Battery

Causes

- a. Excessive resistance in the voltage regulator circuit
- b. Defective regulator
- c. Defective battery

Possible Remedies

- a. Clean and tighten connections.
- b. Repair and replace the regulator.
- c. Recharge or replace the battery.

8. Excessive use of battery water or electrolytes

Causes	Possible Remedies
a. Battery cranked-case housing defective	a. Replace battery housing.
b. Voltage regulator setting too high	b. Lower the voltage setting.
c. Loose battery sealing compound	c. Reseal the battery sealing compound.

Activity 4

1. Check the carbon brush of the alternator assembly.
2. Check the troubles of the generator assembly.
3. Check the ground connection of the battery.
4. Check the fan belt of the alternator.

Self-check:

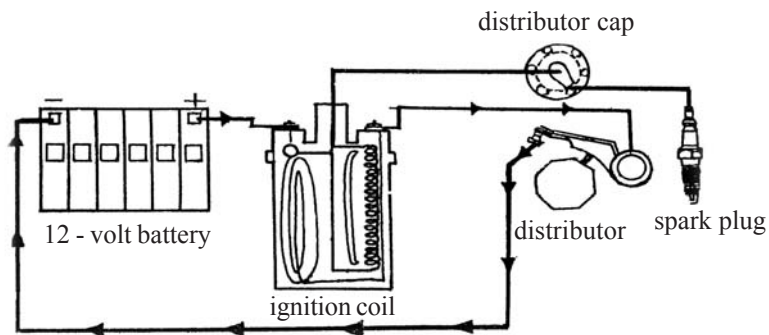
1. Did you check the carbon brush of the alternator assembly?
2. Did you check the troubles of the generator assembly?
3. Did you check the ground connection of the battery?
4. Did you check the fan belt of the alternator and the generator?

Lesson 3 The Parts and Function of the Ignition System

The ignition system consists of the primary or low voltage circuit and the high voltage circuit. The function of the ignition system is to ignite the fuel mixture inside the cylinder.

1. The Ignition Coil

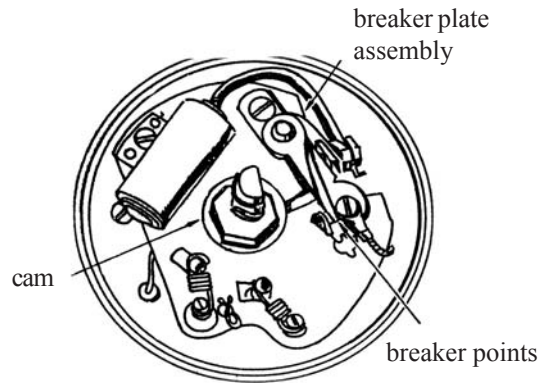
It is a step-up transformer that multiplies current from 20,000 to 30,000 such that the current will jump to the gap of the spark plug.



The Ignition Coil

2. Distributor

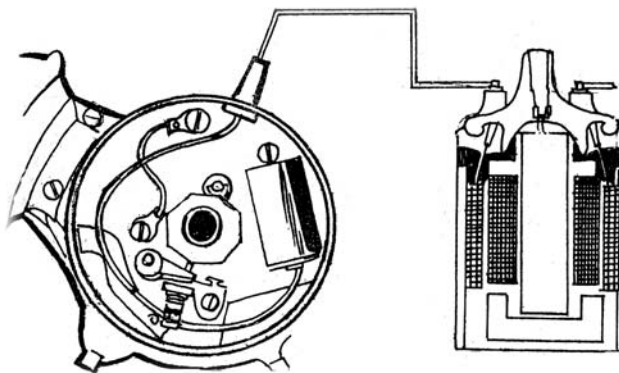
The breaker points are supported by the breaker plate which is positioned to enable the cam to open the point. The function is to open and close the breaker points through the action of the cam.



The Distributor

3. Condenser

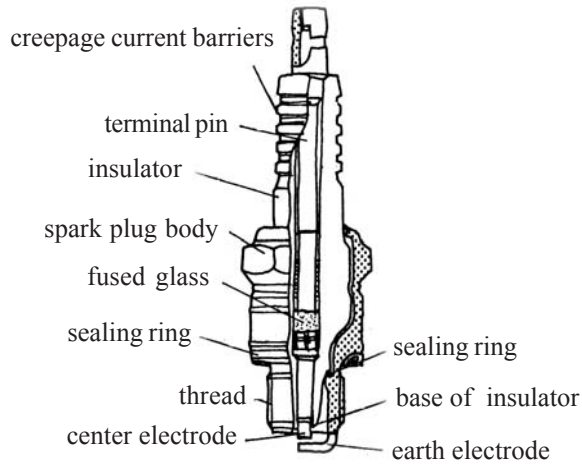
It has the capacity to store electrical energy and absorb excess current supplied by the ignition coil.



The Condenser

4. Spark Plug

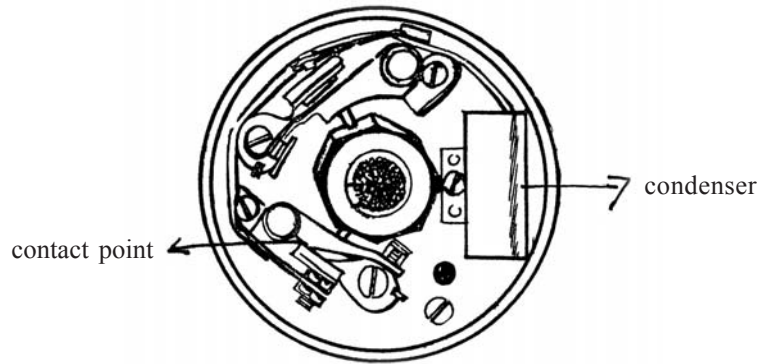
This is a device inserted into the combustion chamber of an engine containing an insulated center electrode for conducting high tension current from the ignition distributor.



The Spark Plug Assembly

5. Breaker Point (contact point)

It provides a longer dwell period to induce the saturation of the coil.

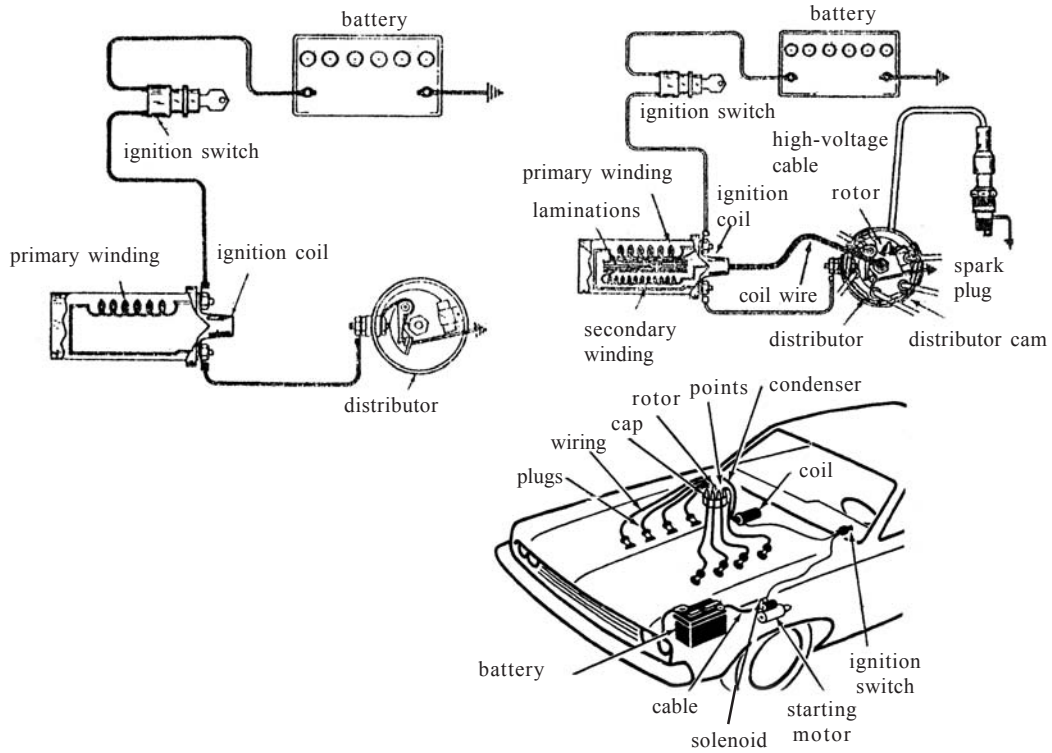


Breaker Point Installation

The two circuits of the ignition system are the electrical ignition circuit and the electronics ignition circuit.

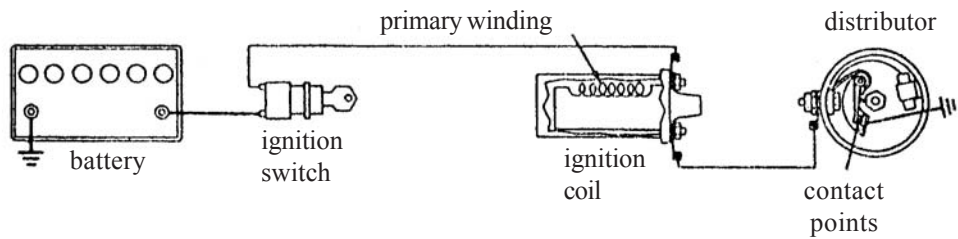
1. Electrical Ignition Circuit

This is connected to a negative grounded battery, the “AM” terminal of the ignition switch which is connected to the positive terminal.

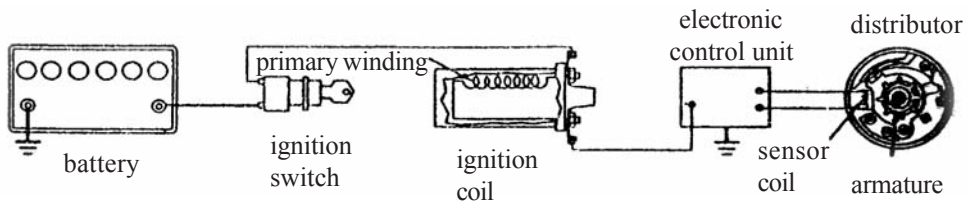


2. The Electronic Ignition Circuit

It uses transistors and other semiconductor devices as an electric switch to turn the primary current on and off.



Contact Point Ignition System
Primary Circuit



Electronic Ignition System
Primary Circuit

Activity 5

1. Conduct a spark test, using the ignition coil and the contact point in the distributor assembly.
2. Remove the ridges on the tip of the contact point by using sandpaper.
3. Remove the carbon deposits in the spark plug, using the sandpaper.

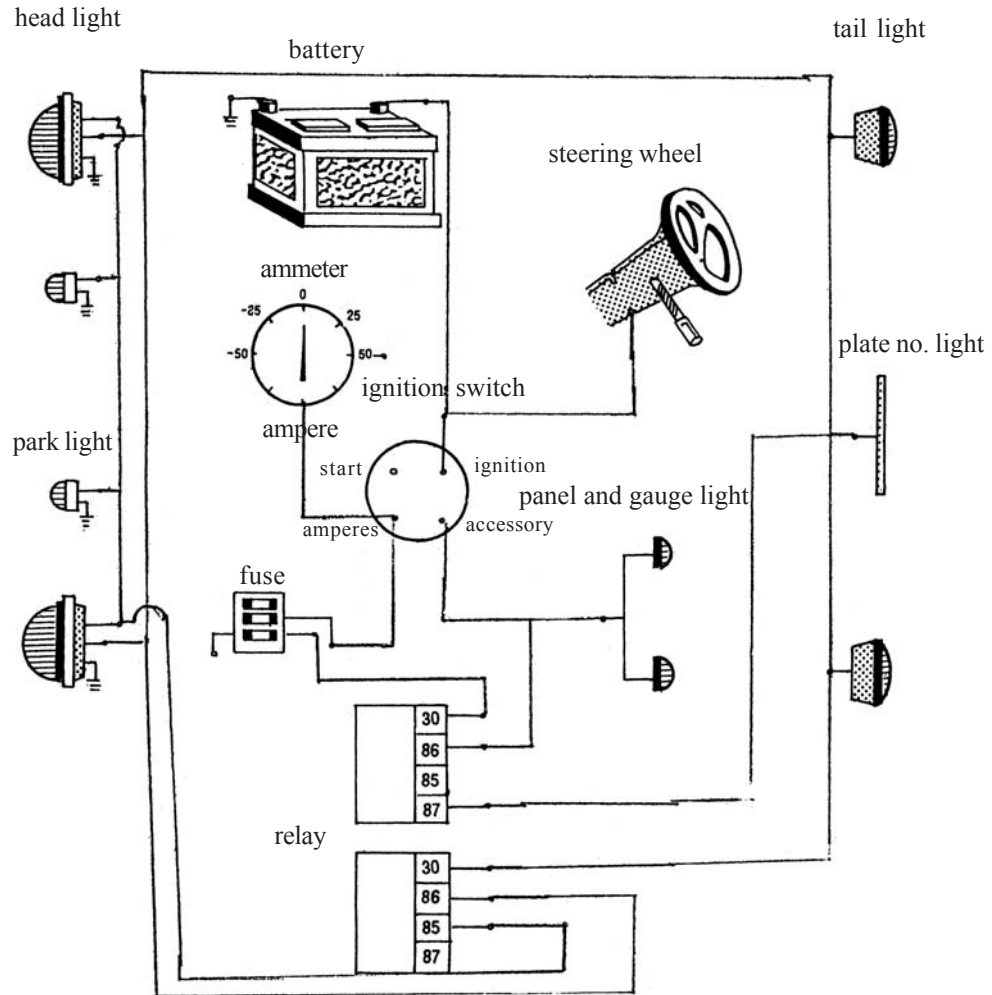
Self-check:

1. Did you conduct a spark plug test in the ignition system?
2. Did you remove the ridges at the tip of the contact point?
3. Did you remove the carbon deposits in the spark plug?

Lesson 4 The Lighting System

The main source of current in an automotive engine is the battery. The current is stored in the battery and supplied to all the lighting systems of a vehicle. The battery is very important, particularly at night when light has to be projected several meter in front of the vehicle to enable the driver to see the road ahead.

1. Headlight - a unit in front of the vehicle for purposes of projecting light several meters ahead of the vehicle.
2. Tail light - a unit indicating the rear of the vehicle by means of red light.
3. Instrument light - this is coated inside the instrument board which illuminates the fuel gauge, oil gauge and speedometer.
4. Dome light - a unit located at the ceiling of the vehicle. It illuminates its interior.
5. Signal light - a device which blinks and flashes to indicate the attention of the driver of a motor vehicle to change direction or stop the vehicle.
6. Stop light - a unit mounted on the rear end of a vehicle, intended primarily to indicate that the vehicle is slowing down or stopping.



Headlight Circuit with Main Switch and Relay

Activity 6

1. Check the headlight switch and the stop light switch and the signal light switches.
2. Check the panel instrument switch of the vehicle.

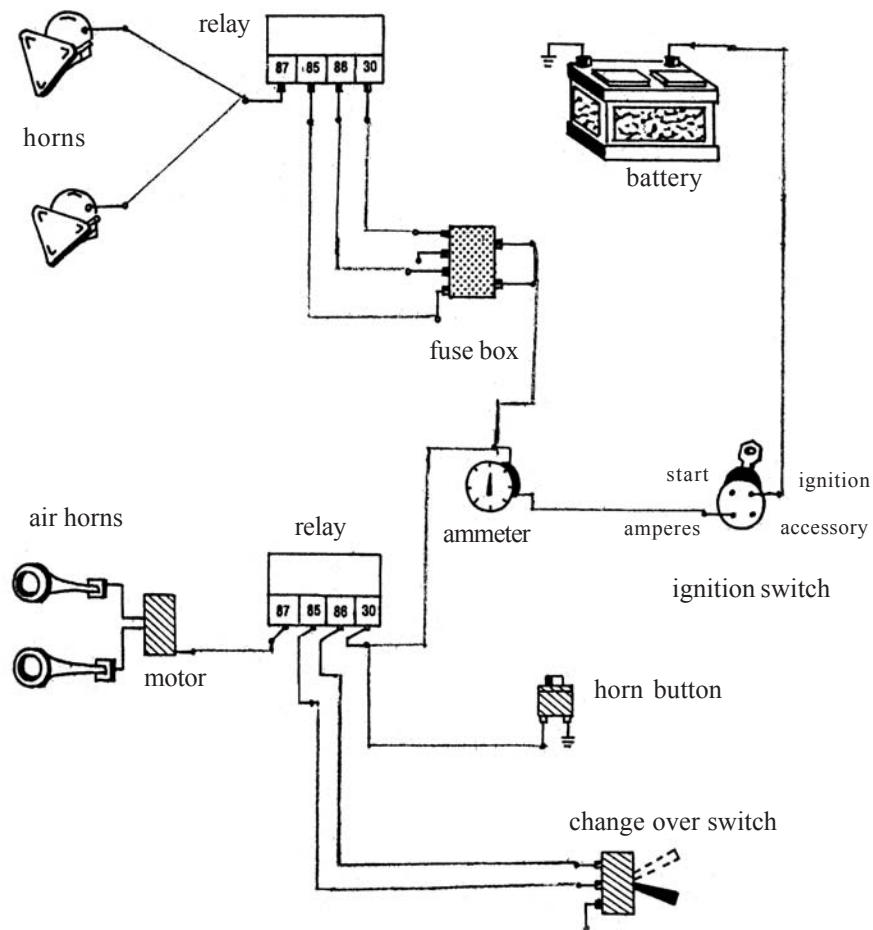
Self-check:

1. Did you check the switches of the stop, signal and headlight switch?
2. Did you check the panel instrument switch of the vehicle?

Lesson 5 The Horn System, Its Parts and Functions

This device is installed in automotive vehicles to warn pedestrians and other motorists. The horn system consist of the battery, horn relay and horn switch.

1. Horn relay - a magnetically operated switch used to carry current directly from the battery to the horn without having the current pass through the horn switch.
2. Battery - a device that converts chemical energy to electrical energy.
3. Horn switch - a device used to open or cut off current throughout the circuit.



Horn Circuit with Air Horn

4. Electric horn circuit - a kind of circuit that is operated by electric current.
5. Air horn circuit - a kind of circuit operated through an air compressor to produce sounds.

Activity 7

1. Check on the fuel and the push button of the electric horn circuit.
2. Check on the air compressor, air hose of the air horn circuit.

Self-check:

1. Did you check on the fuel and push button of the electric horn circuit?
2. Did you check on the air compressor and the air hose of the air horn circuit?

LET'S SUMMARIZE

This module dwells on the parts and functions of the charging, ignition, lighting and horn systems. The various systems of the vehicle have their respective functions in car operation. If one system malfunctions, this has a great effect on car operation, particularly in regard to the ignition system, because automatically, the engine will stop operating.

Other system like charging, lighting and the horn system will not drastically affect the engine operation since function is outside the engine. You will know more about the troubles if these, occur and remedial measures are applied. You will soon experience applying the knowledge and skills learned in automechanic shop.

POSTTEST

Directions: Select the letter corresponding to the best answer to each question. Write the letter on your answer sheet.

1. A kind of circuit operated through an air compressor to produce sounds.
 - a. air horn circuit
 - b. horn relay
 - c. horn switch
 - d. electric horn circuit
2. It is a device that multiplies current and supplies it to the gap of the spark plug.
 - a. condenser
 - b. ignition coil
 - c. contact point
 - d. diode

3. It provides a longer dwell period to induce the saturation of the coil.
 - a. contact point
 - b. condenser
 - c. diode
 - d. ammeter

4. It is a device that absorbs excess current supplied by the ignition coil.
 - a. diode
 - b. spark plug
 - c. condenser
 - d. contact point

5. It is a device that ignites the air-fuel mixture inside the combustion chamber.
 - a. electrode
 - b. spark plug
 - c. diode
 - d. ammeter

6. A trouble in the charging system causing noisy generator.
 - a. grounded field coil
 - b. current regulator setting too high
 - c. faulty regulator assembly
 - d. dragging armature

7. The alternator fails to charge and the possible causes are
 - a. loose or slipping belt
 - b. defective regulator
 - c. worn-out fuse box
 - d. all of the above

8. Produces alternating current and supplies the current surge to the battery.
 - a. commutator
 - b. alternator
 - c. ammeter
 - d. battery

9. It is a device that maintains the charging of the battery.
 - a. alternator
 - b. voltage regulator
 - c. ammeter
 - d. commutator

10. This device converts chemical energy to electrical energy.
 - a. armature
 - b. commutator

- c. battery
- d. generator

KEY TO CORRECTION

Pretest

- 1. c
- 2. b
- 3. b
- 4. d
- 5. d
- 6. c
- 7. b
- 8. a
- 9. c
- 10. a

Posttest

- 1. a
- 2. b
- 3. a
- 4. c
- 5. b
- 6. d
- 7. d
- 8. b
- 9. b
- 10. c