DESIGN OF AUTOMOTIVE CHASSIS ELECTRICAL SYSTEM TRAINING BOARD

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I hereby declared that this report is a result of my own work except for the excerpts that have been cited clearly their references."

Signature : ……

Name : Ahmad Firdaus Bin Mohammad Mohsin

Date : 06 / 04 / 2010

For my beloved father and mother

Mohammad Mohsin Bin Hj Mohd Sidek and Noor Riza Binti Hj Ahamad

In appreciation of supported and understanding.

ACKNOWLEDGEMENTS

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Finally, I would like to honor my parent, for supporting me steadfastly and their appreciated advice through my project completion.

ABSTRACT

Study conducted in this Project Sarjana Muda (PSM) is about automotive chassis electrical system and prepare the specific design of automotive training panel board, that the panel board can be use for teaching and learning purposes. Scope of study in this PSM is design the suitable automotive chassis wiring system for teaching and learning. Based on the wiring diagram, design the automotive chassis electrical system training panel board for teaching and learning purposes, following this training panel board will provide the laboratory sheet to expose the practical training on this project. The main objective is to design automotive chassis electrical system training board for teaching and learning purposes.

ABSTRAK

Kajian dijalankan dalam Project Sarjana Muda (PSM) ini adakah berkenaan sistem elektrik kerangka kenderaan untuk menyediakan satu panel latihan automotif, panel latihan ini boleh digunakan untuk tujuan pengajar dan tujuan pembelajaran. Skop kajian dalam PSM ini adalah untuk mereka bentuk sistem pendawaian yang mudah difahami untuk mengajar dan pengajian. Untuk mereka bentuk sistem elektrik kerangka kenderaan ini adalah berdasarkan gambar rajah pendawaian yang telah dipermudahkan dan sesuai untuk dijalankan bagi tujuan pembelajaran. Objektif utama PSM ini adalah mereka bentuk satu penal latihan sistem elektrik kerangka kenderaan bagi tujuan pembelajaran.

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V	=	Voltage
R	=	Resistance
I	=	Current resistance
P	=	Power
S.F	=	Safety Factor
L	=	Left
R	=	Right
DC	=	Direct Current
AC	=	Alternating Current
r	=	Resistivity
ρ	=	Resistivity of material
HL	=	Head Light
FL	=	Front Left
RL	=	Rear Left
FR	=	Front Right
RR	=	Rear Right
LB	=	Left Brake
RB	=	Right Brake
HI	=	High
LO	=	Low
B+	=	Batteries Positive
E	=	Ground

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CHAPTER 1

INTRODUCTION

1.1 Project Background

The Automotive Electrical Training Board System is designed to realistically simulate the electrical system on an automobile. The unit consists of a number of modular demonstration panels, which are mounted on a wheeled stand that contains a power source and component connecting cables. The components featured are real original parts as commonly used in automobile typically produced by the major car or component manufacturers. This system can be used in the classroom as a demonstration unit to show students various types of wiring and to familiarize them with typical car electrical systems. Also it can be used as a trainer with the student performing actual wiring exercises with the various components. The Original components are mounted on clear Acrylic plastic panels that allow high visibility of all parts and wiring. Connection of the components is easily accomplished by using the cables with stackable plugs that are provided. A 12 Volt DC automobile batteries was used as a power supplied on this automotive chassis electrical system training panel board.

1.2 Objective

To design automotive chassis electrical system training board for teaching and learning purpose.

1.3 Scope

Design training panel board

1. Design automotive chassis electrical wiring system for teaching and learning
2. Create lab sheet for practical training

1.4 Problem Statement

The real automotive electrical system on automobile is difficult to understand because of the automobile that is manufactured is for commercial purposes, so the electrical system that is currently used by automobiles are hidden and complicated. The problem is to create and study automotive electrical system.

The study is to understand the principle electrical system of an automobile chassis, and then transfer it into 'Training Panel Board' which is currently not available in UTeM. The transfer process of the system must base on the suitable electrical wiring system circuit design which is similar to chassis electrical system that is used on automobile and facilitate for teaching and learning purpose.

The aim is to conduct a working experiment or practical training based on automobile chassis electrical system that can be used on this training panel board which is not available in UTeM for Automotive Engineering student.

The other task is to create lab sheet for practical training to fulfill this automotive chassis electrical system training board for experiment.

With that, the system can be used in the classroom as a demonstration unit to show students various types of wiring and to familiarize them with typical car electrical systems. Also it can be used as a trainer with the student performing actual wiring exercises with the various components.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

A literature search was performed to study, design and analysis the chassis electrical system for automobile/car. It also includes the investigation of what other have done in this area. This study includes the areas of electrical and electronic as a guide to design the suitable automobile electrical circuit and automotive chassis electrical system training board.

Modern automobiles rely on a wide variety of electrical / electronic components and systems to operate properly. Electricity plays a major role in the proper functioning of the engine, transmission, even brakes and suspension systems in many cases. A fundamental knowledge of how electricity works is important for any person associated with the automobile studies.

2.2 Power Sources on Car

Two power sources are used on vehicles. When the engine is not running or is being started, the battery provides power. When the engine is running, the alternator provides for the vehicle's loads and for recharging the battery.

Battery

The battery is the primary “source” of electrical energy on vehicles when the engine is not running or is being started. It uses an electrochemical reaction to change chemical energy for starting, ignition, and charging, lighting, and accessories.

Normally all car like Proton, Toyota, and ect vehicle use a 12-volt battery. Batteries have polarity markings, the larger (thicker) terminal is marked “plus” (+) , the other terminal is marked “minus” (-) . Correct polarity is important; components can be damaged if the battery is connected backwards.

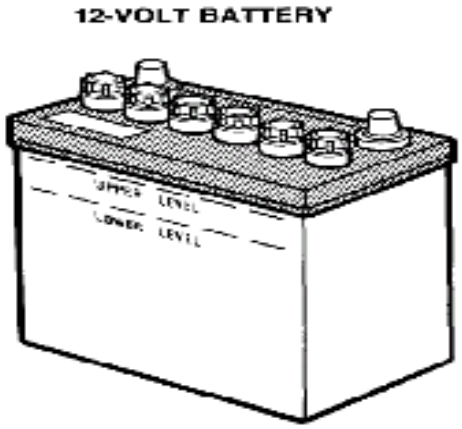

Figure 1: 12 VDC Power Supply

(Source: www.wikipedia.com / electrical component)

Alternator

The alternator is the heart of the vehicle's electrical system when the engine is running. It uses electromagnetism to charge some of the engine's mechanical energy into electrical energy for powering the vehicle's loads and for charging the battery. Currently all car alternators are rated by amps of current output. It's within 40 to 80 amps.

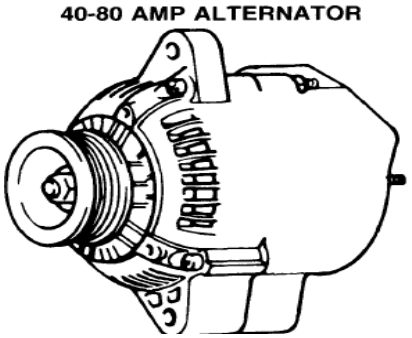

Figure 2: Alternator

(Source: www.wikipedia.com / electrical component)

2.3 Controls

Control devices used in electrical circuits on many type of vehicle include a variety of switches, relay, and solenoids. Electronic control devices include capacitors, diodes, and transistors. Controls are needed to start, stop, or redirect current flow. Most switches require physical movement for operation, relays and solenoids are operated with electromagnetism, electronic controls are operated electrically.

Switches

Switches are the most common circuit control device. They usually have two or more sets of contacts. Opening the contacts is called “opening” or breaking the circuit,” while closing the contacts is called “closing” or “making” the circuit.”Poles” refer to the number of input circuit terminals. Throws refer to the number of output circuits. Such switches are referred to as SPST (single-pole, single-throw), SPDT (single-pole, double-throw), and MPMT (multiple-pole, multiple-throw).

The various types of switches include:
Hinged pawl - a simple SPST switch to make or break a circuit.
Momentary contact – another SPST switch, normally open or closed, which makes or breaks the circuit when pressed, typically used for the horn switch.
SPDT – one wire in, two wire out, commonly used in high-beam / low-beam headlamp circuits.
MPMT – movable contacts are linked to sets of output terminals, may be used for the transmission neutral start switch.
Mercury switch – liquid mercury flows between contacts to make circuit, commonly used to turn engine compartment and trunk lamp on and off.
Temperature-sensitive switch – a bimetal element bends when heated to make contacts completing a circuit or to break contact opening a circuit. The same principle is also used in time-delay switches and flashers.

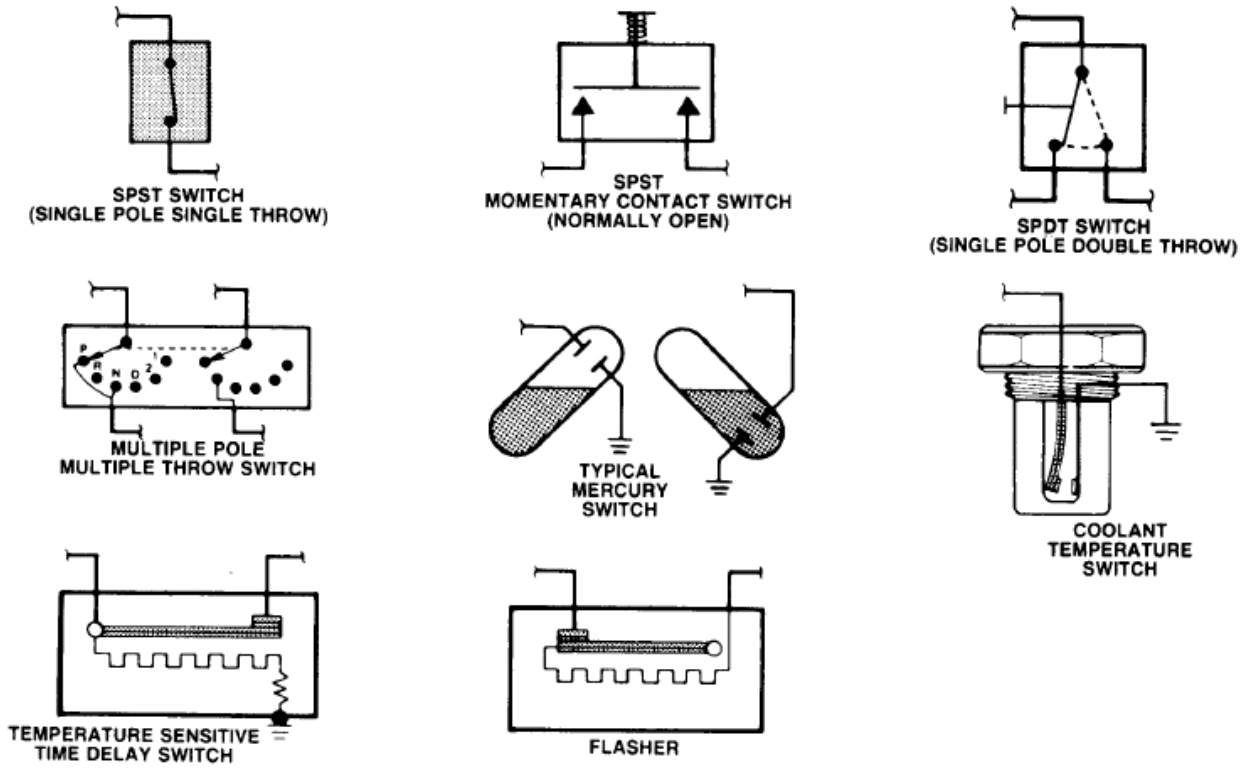

Figure 3: Type of switches

(Source: www.wikipedia.com / electrical component)

Relay

A relay is simply a remote-control switch, which uses a small amount of current to control a large amount of current. A typical relay has a control circuit and a power circuit. The control circuit is fed current by the power source, and the current flows through a switch and an electromagnetic coil to ground. The power circuit is also fed current from the power source and the current flows to an armature which can be attracted by the magnetic force on the coil.

In operation, when the control circuit switch is open, no current flow to the relay. The coil is not energized, the contacts are open, and no power goes to the load. When the control circuit switch is closed, however, current flows to the relay and energizes the coil. The resulting magnetic field pulls the armature down, closing the contacts and allowing power to the load. Currently many relays are used on automobile for controlling high current in one circuit with low current in another circuit.

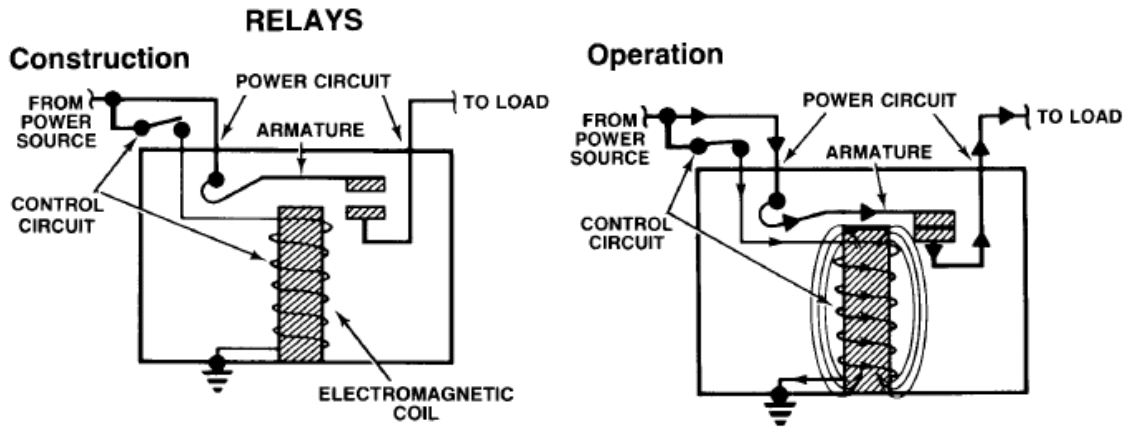

Figure 4: Relay

(Source: www.google.com / electrical component)