

JOB ROLE – AUTOMOTIVE SERVICE TECHNICIAN

Sector: Automotive
(Qualification Pack Code : **ASC/Q01402**)



PSS Central Institute of Vocational Education
Shyamla Hills, Bhopal – 462013, Madhya Pradesh, India

www.psscive.ac.in

UNIT 5 : Auto Electrical

**Session 1 : Automotive Electrical and Electronics
Symbol, Reading of Circuit Diagramme, Cables
Specification and Colour Code, Wiring Harness**

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Session Objectives

1. The student will be able to identify electrical and electronics symbols used in automotive electricity.
2. Able to read electrical and electronics circuits used in automobiles.
3. Able to understand and identify cable specifications and colour codes used in automotive electrical.

Introduction

One of the most important component in automobile technology is use of appropriate technology. These technology are driven by appropriate signals. Automobile Electrical is one of the most appropriate technology used now a days. It is necessary that proper maintenance, repair and maintenance of auto electrical items in a vehicle are done by trained authorized mechanic. In this unit important components of auto electrical has been discussed.

The Automotive Electrical and Electronics Symbols

SYMBOL	COMPONENT NAME	DESCRIPTION
Wire Symbols		
		
	Electrical wire	Symbol represents the electrical wire.
	Wire connected	Fig. represents the symbol for wires that crossed but are joined together. The dots at the intersection indicates the joining the wires.
	Wire not connected	Fig. represents the symbol for wires that crossed but are not joined.
Switch and Relay Symbols		
	SPST Toggle Switch	Disconnects current when open

Automobile Cables and their specification

Various kinds of cables are employed in the wiring of present-day automobiles. While selecting the cable size, the voltage drop is kept in mind. Generally, the voltage drop permitted for a particular length of cable under its full current loading capacity is of the order of 10%. It may be mentioned that these days the cables used in automobiles are of the stranded type instead of the single-conductor type. The stranded cables are more flexible than the single one but they are not easily soldered.

Automobile cables can be classified into three main categories :

- Starting system cables
- General purpose cables
- High-tension cables

Starting System Cables

When the cranking motor is switched on, it draws heavy current in the beginning of its operation. Hence it is quite essential to employ the type of cable which is capable of conducting such heavy currents. Generally, three different cables are used for starters having insulation of either vulcanized rubber or of PVC (polyvinyl chloride).

General Purpose Cables

There are **twelve** different sizes of cables which are generally used for automobiles as the standard sizes. **These sizes include cables of 9/035-120/0.350 for single conductor type and 9/0.350-35/0.350 for twin conductor cables. A three conductor cable of 9/0.350 size is also used.**

High-Tension (HT) cables

The cables connecting the ignition coil to the central point of the distributor and from the distributor to the various spark plugs fall under the category of HT cables. These cables are subjected to very high voltages such as those of the order of 6000-22,000 V. They are exposed to engine bonnet temperature and also come in contact with oil, petrol and water. Due to this, it is essential that these cables must have a special kind of insulation. Earlier, these cables were having an insulation of natural rubber. The overall diameter of the cable is of the order of 7-12 mm.

Cable Colours Code :- In order to quickly identify and also to simplify the wiring system, the cables are coloured. The seven colour code system is the general one and involves brown, yellow, red, white, green, blue and black colours.

Brown Cables

Brown cables are used for the battery circuit. It is used from the cranking motor switch to the ammeter, to the radio receiver, to the electric clock, to the inspection sockets and to the battery auxiliary fuse.

Yellow Cables

These are used for the generator circuit. The cable is used from the generator terminal to the corresponding control-box terminal and to the ignition warning light.

White Cables

These cables are used for the ignition circuits and also for other circuits which do not require fuses and are operated through the ignition switch, such as the electric fuel pump, motor starter, solenoid switch and so on.

Green Cables

These cables are used for all the auxiliary circuits which are fed through the ignition switch but are protected by the fuses. Examples of these circuits are the brake stop lamps, the fuel gauge, the windscreen wipers, the direction indicators, etc.

Blue Cables

These cables are used for the headlamp circuits. These cables are used for the side and tail lamp circuits. It is also used for fog lamps, panel lights and other lamps which are only used when the side lamps are in operation.

Black Cables

These cables are used for the earth circuits.

Following are the examples of a typical wire colour code tables (Ford and Chrysler) :

SOLID COLOUR

STRIPED

HASH MARKED

WIRING COLOUR KEY (PRIMARY COLOURS)

BK	--	BLACK	Y	--	YELLOW	
BR	--	BROWN		DB	--	DARK BLUR
GY	--	GRAY	LB	--	LIGHT BLUE	
O	--	ORANGE		DG	--	DARK GREEN
P	--	PURPLE		LG	--	LIGHT GREEN
PK	--	PINK		(D)	--	DOT
R	--	RED		(H)	--	HASH MARK
T	--	TAN		SRTIPE IS UNDERSTOOD		
W	--	WHITE				

FORD COLOUR CODES

WIRING COLOUR CODE CHART					
COLOUR CODE	COLOUR	STANDARD TRACER COLOUR	COLOUR CODE	COLOUR	STANDARD TRACER CODE
BK	BLACK	WH	PK	PINK	BK OR WH
BR	BROWN	WH	RD	RED	WH
DB	DARK BLUE	WH	TN	TAN	BK
DG	DARK GREEN	WH	VT	VIOLET	WH
GY	GRAY	BK	WT	WHITE	BK
LB	LIGHT BLUE	BK	YL	YELLOW	BK
LG	LIGHT GREEN	BK		WITH TRACER	
OR	ORANGE	BK			

CHRYSLER COLOUR CODES

MAIN CIRCUIT IDENTIFICATION CODES (CHRYSLER)

A1 Battery Circuit to Ammeter.

- J3 Ignition Switch Start Circuit.
- A2 Battery Circuit to Ammeter.
- B Back Up Lamp Circuit.
- C Air Conditioning and Heater Circuits.
- D Emergency, Stop Lamp and Turn Signal Circuits.
- E Instrument Panel Cluster, Switches and Illumination Circuits
- F Radio Speakers and Power Seat Circuits.
- G Gauges and Warning Lamp Circuits
- H Horn Circuit.
- J Ignition System Run Circuit.
- J1 Ignition Switch Feed Circuit.
- K Trailer Tow.

Window Circuit

- XL Lighting Circuit (Exterior Lights)
- M Lighting Circuit (Interior Lights).
- P Brake Checking Circuit.
- Q2 Accessory Buss Bar Feed (Fuse Block).
- Q3 Battery Buss Bar Feed (Feed)
- R3 Alternator Circuit to Electronic Voltage Regulator (Field).
- R6 Alternator Circuit to Ammeter (Feed)
- S Starter Motor and Starter Relay Circuit
- T Trunk Lamp Circuit.
- V Windshield Wiper and Washer Circuit.
- W Power Radio, Cigar Lighter, Lamp Grounds, Clock, Speed Control, Power Antenna, Deck Lid and Door Locks

Wiring Harness :-

The electrical system of present-day cars is quite complex. Connecting each electrical component individually is a tedious and costly affair. With the adoption of wiring harness method, it has become quite simple to connect the various electrical components. It has also resulted in space saving and safeguarding of the individual cables from metal objects. The harness shown in following fig. is simplified one. The harness consists of bunches of cables leading to the various components to be connected. Each bunch is bound together with a PVC tape, leaving sufficient lengths of individual cables protruding at each end for making the necessary electrical connections easily.

Summary

In this session you have learnt about , Automobile Cables and their specification :- Various kinds of cables are employed in the wiring of present-day automobiles. While selecting the cable size, the voltage drop is kept in mind.

Automobile cables can be classified into three main categories :

Starting system cables

General purpose cables

High-tension cables

Wiring Harness

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Project Coordinator : Dr. Saurabh Prakash, Professor,
Department of Engineering and Technology

Assistance

Er. Kuber Singh , Consultant



Joint Director

PSS Central Institute of Vocational Education
Shyamla Hills, Bhopal – 462013 , Madhya Pradesh, India

E-mail: jdpsscive@gmail.com

Tel. +91 755 2660691, 2704100, 2660391, 2660564

Fax +91 755 2660481

Website: www.psscive.ac.in