UNIT 3: GENERAL ELECTRICAL SYSTEM DIAGNOSIS

LESSON 2: PRELIMINARY ELECTRICAL/ELECTRONIC SYSTEM DIAGNOSIS

I. Functions and components of a work order

NOTE: See JS1-L2-U3 for a sample work order.

A. The work order serves several functions.

1. Itemizes repairs by listing the cost of parts and labor
2. Can be used to authorize service or repairs
3. Has the necessary information on how to contact the owner and serves as documentation for future reference
4. May also specify limited warranties and liabilities of the shop
5. May serve as a reference for recent service history for warranty or legal purposes

B. A work order typically has the following components.

1. Customer name, address, and phone number (home or work with extension number)
2. Date
3. Invoice number
4. Year, make, model, vehicle identification number (VIN), and vehicle mileage
5. Name/initials of the service writer and technician
6. Customer authorization signature to allow repairs
7. Description of customer concern
8. Vehicle service history information
9. Related technical service bulletins (TSBs)

10. Technician's notes, including diagnostic procedures performed, the results of diagnosis, and any important observations or remarks

11. Component or system defect responsible for the concern

12. Service performed to successfully correct the concern

13. Labor procedures and costs based on the parts and labor estimation guides

14. Outside labor procedures and costs that include if a shop sent a particular part out to another shop for repairs

15. Listing of each part that includes name, description, and cost

16. Sales tax, which is usually calculated on parts only

17. Total that represents the final price that the customer will pay for all charges related to the repair

C. Work orders may be handwritten or prepared by entering codes in a computer terminal and then printed.

D. Depending on the part, the following information may be required for ordering repair parts.

1. Make, model, and model year (found on the driver's side door jamb) of the vehicle

2. VIN

3. Engine information that includes engine size, in cubic inches or liters, the number of cylinders, and the type of fuel system

4. Wheelbase

5. Number of doors

II. Procedures for identifying and interpreting the electrical/electronic system concern

A. It is very important to identify and interpret the customer's concern before beginning diagnosis of the electrical/electronic system.

B. Have the customer describe the concern. Pay careful attention to what is being described. Make sure to record what the customer says.

C. Ask the customer the following series of questions. Make sure to record the answers.

1. What electrical/electronic system functions are involved?
2. When did the concern first occur?
3. Is the concern continuous or intermittent?
4. Is the charge indicator functioning normally?
5. Is the malfunction indicator lamp on or flashing?
6. Has the concern affected vehicle performance?
7. What is the recent service history of the vehicle?
8. Is the vehicle making any unusual noises?
9. Are any unusual vibrations occurring?

D. Based on the answers to the questions, determine the next step in the diagnostic process for the vehicle.

III. Procedures for identifying hybrid vehicle high voltage circuits and circuit disconnect (service plug) locations and safety precautions

A. A hybrid vehicle, also called a hybrid electric vehicle (HEV), uses both an electric motor and a small, internal combustion engine for power. The two types of HEV designs are series and parallel.

1. In the series design, an electric motor drives the vehicle with power from a battery pack. The internal combustion engine is used solely to power the generator that, in turn, recharges the battery pack.
2. In the parallel design, the electric motor and internal combustion engine both drive the vehicle, with the electric motor being used when additional power is needed (e.g., acceleration, going up hill) and the internal combustion engine taking over at cruising speeds.

B. The thought process behind HEVs is to meet the desire to decrease dependence on oil and lessen environmentally harmful emissions.

1. At this printing, HEVs are entering the marketplace gradually, but they are in their infancy and technology is still evolving.

2. It is unknown whether HEVs will eventually replace the standard gasoline-powered vehicles or if they are primarily an interim step toward another technology.

3. Currently, the advantages of HEVs are improved mileage and less emissions. Among the disadvantages are more complicated designs and heavier vehicles due to the additional components.

C. Servicing HEVs can be potentially dangerous. Careless service can result in potentially fatal electrical shock, arcing temperatures up to 3,500°F, or explosion of molten metal. It is imperative to know and adhere to service precautions.

1. During service, the technician must wear high-voltage safety gloves similar to an electrical lineman's gloves when removing the service plug. The technician should also shield the face.

2. At this printing, high-voltage cables are orange. Also, caution labels are used to identify the high-voltage battery pack and other high-voltage components.

CAUTION: Be sure to identify the high-voltage cables before beginning service. Not all high-voltage cables are bright orange. Some are very light orange and can appear yellow.

3. High-voltage cables can be located near vehicle lift locations. Be sure lift pads are placed properly.

4. Some components contain strong magnets that must be handled with special care. People with pacemakers or other magnetically-sensitive medical devices should not work on or near these components. The technician should remove all metal items from pockets or clothing before beginning service.

5. The high-voltage system should be disconnected before beginning service. Disconnecting the auxiliary battery shuts down the high-voltage circuit. For additional protection, the service plug can be removed.

6. Wait at least five minutes after removing the service plug to allow the capacitors inside the inverter to fully discharge.

7. Some HEVs automatically turn the engine on and off when the ready light, located on the instrument panel, is on. Remove the key from the ignition before beginning service.

D. Identify hybrid vehicle high voltage circuits and circuit disconnect (service plug) locations and safety precautions.

1. Using service information, determine the locations of the high-voltage system components, including the high-voltage cables and service plug.

2. Using service information, determine if special care is needed when handling any components of the high-voltage system.

3. Deactivate the high-voltage system.

CAUTION: The following procedure is for a Honda HEV. It is imperative to consult service information for the proper procedures for the specific HEV before beginning service.

a. Turn off the ignition switch.

b. Remove the rear seat back.

c. Remove the battery module cover from the intelligent power unit (IPU) lid.

d. Remove the locking cover from the battery module switch.

e. Turn off the battery module switch.

f. Turn the locking cover around and put it back on the battery module switch.

g. Wait at least five minutes to allow the capacitors inside the inverter to fully discharge.

h. Remove the IPU lid.

i. Measure voltage at the junction board terminals. There should be 30 volts or less. There is a problem if there is more than 30 volts.