

# Charging System 812FJ

Student Manual

## Charging System

### Activity 10

## Battery Maintenance

#### *Performance Objectives:*

- Inspect, clean, and fill battery.
- Replace and reinstall battery.
- Inspect, clean, and repair or replace battery cables, connectors, and clamps.

#### *Tools and Materials:*

- 12-Volt Battery in Shop Vehicle
- Battery Pliers
- Battery Clamp Puller
- Battery Clamp Spreader
- Terminal Cleaning Brush
- Battery Carrier
- Baking Soda and Water Solution
- Distilled or Demineralized Water
- Petroleum Jelly
- Safety Goggles

#### *References:*

- Ford Service Manual Information - Battery Maintenance

### ***Battery Care and Maintenance:***

In order to maximize the service life of any automotive battery:

- The battery should be kept clean.
- The battery should be kept correctly charged.
- The battery should have the electrolyte kept at the correct level.
- The battery should not be exposed to excessive shocks or vibrations.

### ***Service Manual Information:***

- Read the Ford Service Manual Information - Battery Maintenance section and answer the following questions:

### ***Battery Cleaning:***

1. According to Page 1, battery life can be extended by keeping the battery clean and dry.
  - a. True
  - b. False

**Note:** Dirt and moisture on top of a battery can provide a conductive path to ground that slowly discharges the battery. Keeping the top of the battery clean prevents this unwanted “load”.

2. What solution can be used to neutralize battery terminal corrosion?
  - a. Electrolyte
  - b. Baking flour and water
  - c. Baking soda and water
  - d. Sugar and water
3. What can be applied to the battery posts to prevent corrosion?
  - a. Electrolyte
  - b. Long-Life Grease or petroleum jelly
  - c. Baking soda and water
  - d. Baking flour and water

### ***Removal and Installation:***

4. Technician A says that automotive batteries should be returned to an authorized recycling facility for disposal. Technician B says that batteries should be disposed of by throwing them in the trash or sending them to a landfill. Which Technician is correct?
  - a. Technician A only
  - b. Technician B only
  - c. Both Technician A and Technician B are correct
  - d. Neither Technician A nor Technician B is correct

Learned control module values and module memory settings are erased whenever the battery is disconnected. Some control modules may require a reset with a factory scan tool or a memory relearn procedure following a battery disconnect or they may not work. For example, in some vehicles the radio won't work until the factory security code has been reentered if the battery has been disconnected.

**Important: Always consult and follow the vehicle manufacturer's service procedures whenever disconnecting a battery.**

In the interest of customer satisfaction, saving learned values and memory settings may be faster and easier than recording and relearning them in some cases. This can be done by connecting a suitable auxiliary battery or alternate power source to the vehicle before disconnecting the vehicle's battery. Care must be taken to connect this auxiliary battery or alternate power source in a safe, secure manner. There should be no chance of injury or component damage from the alternate power source grounding or arcing.

5. Technician A says that the negative battery cable should be disconnected first when removing a battery. Technician B says that the positive battery cable should be connected first when installing a battery. Which Technician is correct?
  - a. Technician A only
  - b. Technician B only
  - c. Both Technician A and Technician B are correct
  - d. Neither Technician A nor Technician B is correct

Because most vehicles are negative ground, if the wrench touches metal while the positive cable is being removed a short circuit to ground occurs. This can cause a spark which can damage vehicle electrical components. In addition, batteries produce hydrogen gas, which can explode if ignited by a spark. Injury and damage to the vehicle or its components can result.

**Important: For safety's sake, always disconnect the negative cable first whenever battery cables are being disconnected. Always connect the positive cable first whenever battery cables are being connected.**

When reconnecting the battery cables, top post style battery terminal bolts should be torqued to 4–6 lb. ft., 50–70 lb. in., or 5.4–8.1 N-m. Side terminal style battery bolts should be torqued to 7.5–15 lb. ft., 90–180 lb. in., or 10–20 N-m.

6. According to Page 6, how far may a vehicle need to be driven to relearn adaptive strategy following a battery disconnect?
  - a. 40 miles or more
  - b. 30 miles or more
  - c. 20 miles or more
  - d. 10 miles or more

**Note:** This relearn example is for a pre-OBD-II Ford car. Other vehicle makes, models, or years or other types of control modules may require different relearn procedures as previously discussed.

**Tools:**

7. Proper use of which tool avoids the damaging lateral or twisting forces that result when using a pry bar or pliers?
  - a. Battery Clamp Puller
  - b. Battery Carrier
  - c. Battery Pliers
  - d. Battery Clamp Spreader

***Adding Water:***

8. Technician A says that filler cap batteries with level indicators should be filled just to the level of the indicator. Technician B says that filler cap batteries without level indicators should be filled to a level of  $\frac{1}{4}$  to  $\frac{1}{2}$  inch (6.3 to 12.7mm) above the plates. Which Technician is correct?
  - a. Technician A only
  - b. Technician B only
  - c. Both Technician A and Technician B are correct
  - d. Neither Technician A nor Technician B is correct
  
9. Topping up a battery with electrolyte will extend the battery's life.
  - a. True
  - b. False

**Conclusion:**

Corrosion and dirt on the top of a battery can cause a slow discharge. Keeping a battery clean can extend its life. A solution of baking soda and water can be used to neutralize any corrosion. Also, a small amount of grease applied to the terminals can prevent corrosion.

When removing a battery, always disconnect the negative cable first to avoid accidental shorting of the positive terminal to vehicle ground. When installing a battery, always connect the negative cable last for the same reason.

Many of today's vehicles with adaptive learning features will lose their memory when the battery is disconnected. Some control modules may require a reset with a factory scan tool or a memory relearn procedure following a battery disconnect. In some cases, saving learned values and memory settings by carefully connecting an auxiliary battery or alternate power source to the vehicle before disconnecting the battery may be faster and easier than recording and relearning those values.

**Complete the In-Shop Worksheet at this time.**

# In-Shop Worksheet

## Activity 10

### Battery Maintenance

#### *Tools and Materials:*

- 12-Volt Battery in Shop Vehicle
- Auxiliary battery or alternate power source (as required)
- Battery Pliers
- Battery Clamp Puller
- Battery Clamp Spreader
- Terminal Cleaning Brush
- Battery Carrier
- Baking Soda and Water Solution
- Distilled or Demineralized Water
- Petroleum Jelly
- Safety Goggles
- Service Information - for your live vehicle, locate the procedures for:
  - Battery removal and replacement
  - Control module memory relearn following battery disconnection.

**Important:** Because of the materials used in the manufacture of automotive lead-acid batteries, dealers and service shops that handle them are subject to regulations issued by OSHA, EPA, DOT, and various state or local agencies. Other regulations may also apply in other locations. Always know and follow these regulations when servicing or handling batteries.

**Important:** Wear safety goggles.

**Note: Always use caution when handling a battery since battery gases (hydrogen) are EXPLOSIVE and the acid can cause severe burns.**

#### *Procedures:*

- Check off each step in each of the following procedures as you perform it.

#### *Inspect, Clean, and Fill:*

- Inspect the battery, cables, and terminals for cracks, dirt, or corrosion.
- If necessary, clean battery with solution of baking soda and water. Rinse off with tap water.
- If battery has removable vent caps, inspect the water level in each cell and add distilled water as necessary.

***Battery Removal:***

- Before disconnecting the battery cables, locate and read any applicable control module memory relearn or reset procedures that will need to be performed after the battery has been disconnected.
- Following the step-by-step service information procedure, remove the battery from the live vehicle. Check off each step as you perform it.

**Important: For safety's sake, always disconnect the negative cable first whenever battery cables are being disconnected.**

- Clean battery posts and cable clamps with Terminal Cleaning Brush.
- Remove battery hold-down clamps (if applicable).
- Remove battery from vehicle using Battery Carrier.
- If necessary, clean battery tray with wire brush and scraper.

***Battery Installation:***

- Following the step-by-step service information procedure, reinstall the battery into the live vehicle. Check off each step as you perform it.

**Important: For safety's sake, always connect the positive cable first whenever battery cables are being connected.**

**Note:** Do not over-tighten bolts. When reconnecting the battery cables, top post style battery terminal bolts should be torqued to 4–6 lb. ft., 50–70 lb. in., or 5.4–8.1 N-m. Side terminal style battery bolts should be torqued to 7.5–15 lb. ft., 90–180 lb. in., or 10–20 N-m.

- Apply a small amount of petroleum jelly to terminals.
- After connecting the battery cables, perform any necessary control module memory relearn or reset procedures per the service information procedure. If an auxiliary battery or alternate power source was used to preserve these settings, be sure to verify that the settings were actually saved.

1. Did you successfully complete all of the above tasks?
  - a. Yes
  - b. No

**Conclusion:**

Battery maintenance includes inspecting, cleaning, and filling the battery (if applicable). Follow the manufacturer's service procedures when removing and installing the battery. When removing a battery, always disconnect the negative cable first and be sure to use the proper tools to avoid damaging the battery posts. During installation, connect the positive cable first and the negative cable last.