AUTOMOTIVE Youth Educational Systems YES
The Passport to a Rewarding Automotive Career

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Modern Automotive Technology Chapter 29

Automotive Batteries

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Learning Objectives

- Describe safety practices when testing and servicing a battery
- Visually inspect a battery for problems
- Perform battery tests
- Clean the battery case and terminals
- Jump start a car using a second battery
- Replace a defective battery

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Battery Parts

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Battery Functions

- Operate the starter, ignition, and fuel injection during cranking
- Supply electrical power when the engine is not running
- Supply electrical power when current demands exceed alternator output
- Act as a capacitor (stabilize voltage)
- Store energy for extended periods

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Discharging

- Changes chemical energy into electrical energy
- Stored energy is released

Charging

- Electrical energy is converted to chemical energy
- Energy is stored until needed

Battery Cycling

- Repeated charging and discharging
- Deep cycling
  - going from a very low charge to full charge
  - can shorten service life

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1. LEAD STRAPS run along the upper portion of the case to connect the plates.

2. A BATTER CELL consists of a negative plate, positive plate, container, and electrolyte.

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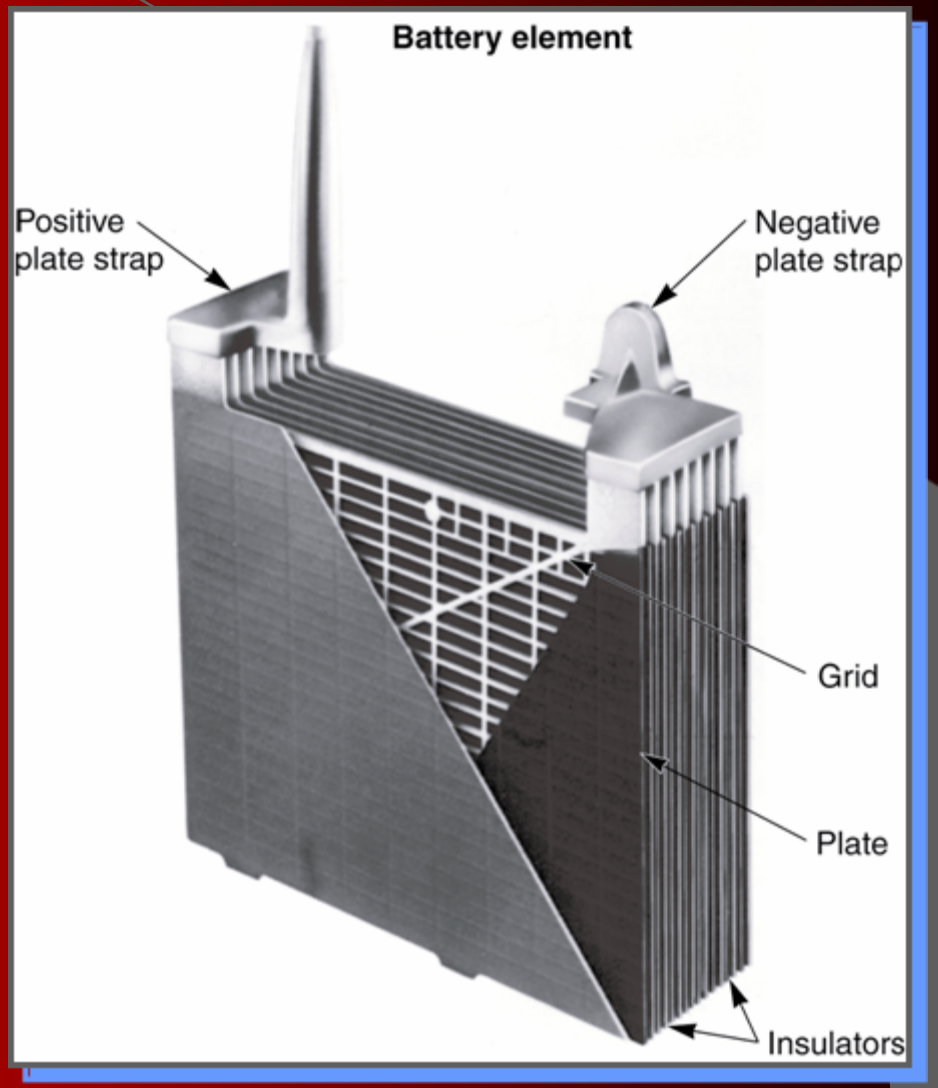
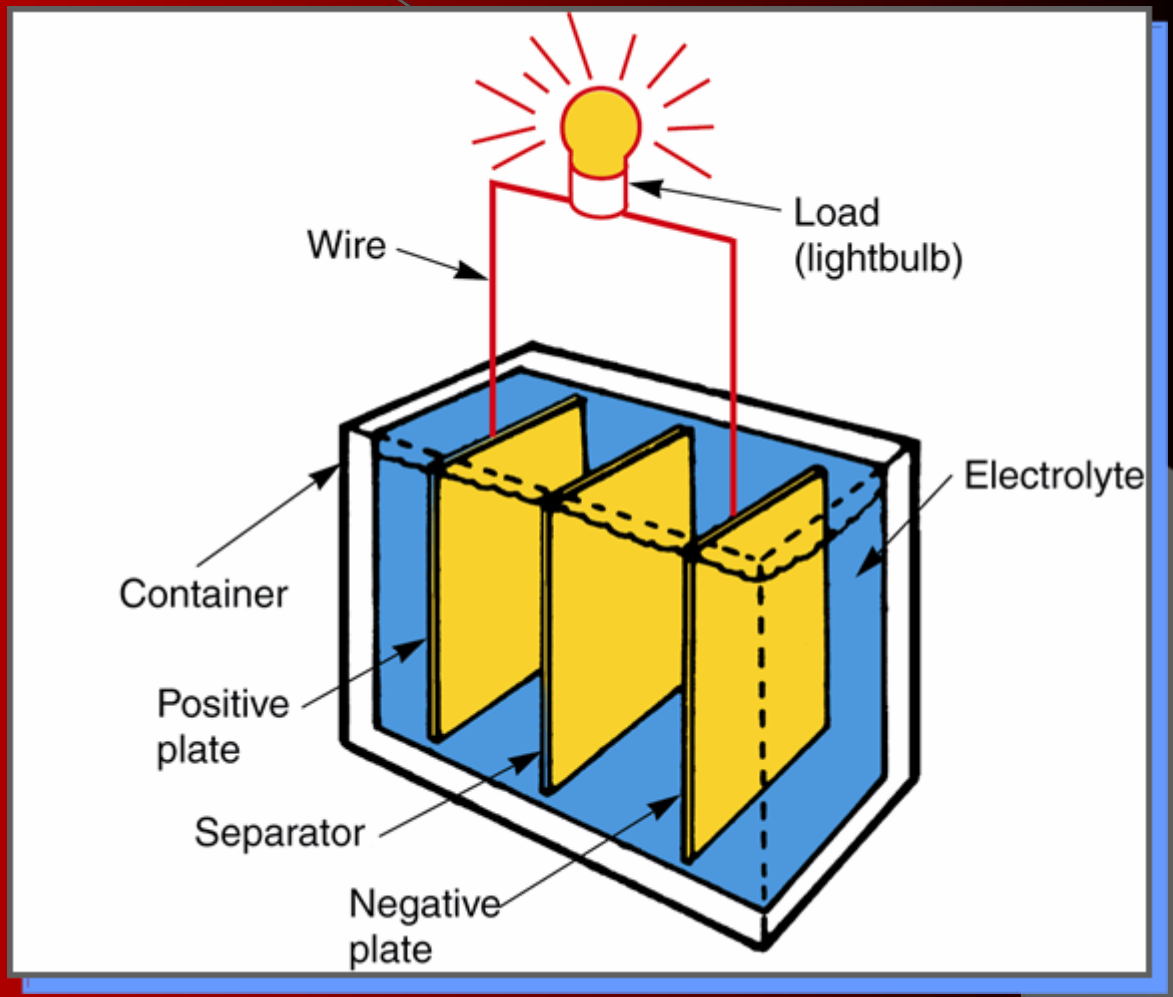
Battery Element

Most automotive batteries have six elements



Lead-Acid Battery Cell

Electrolyte causes a chemical reaction between the plates, producing 2.1 volts



Electrolyte

- Mixture of sulfuric acid and distilled water
- Poured into each cell until plates are covered
- **Warning: Electrolyte will cause serious burns or blindness, if it comes in contact with your skin or eyes!**

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3. A BATTERY ELEMENT makes up of positive plates, negative plates, straps, and separators.

4. A MAINTENACE FREE BATTERY does not have removable filler caps.

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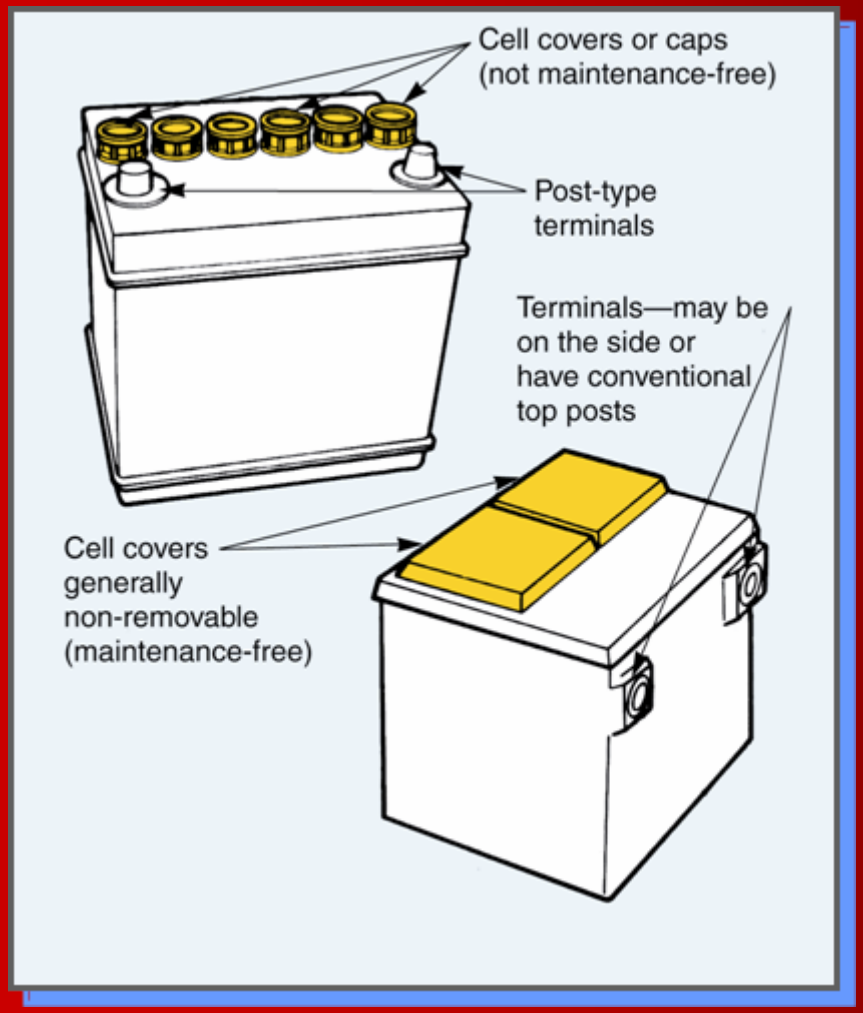
Battery Terminals



Means of connecting the battery to the vehicle's electrical system

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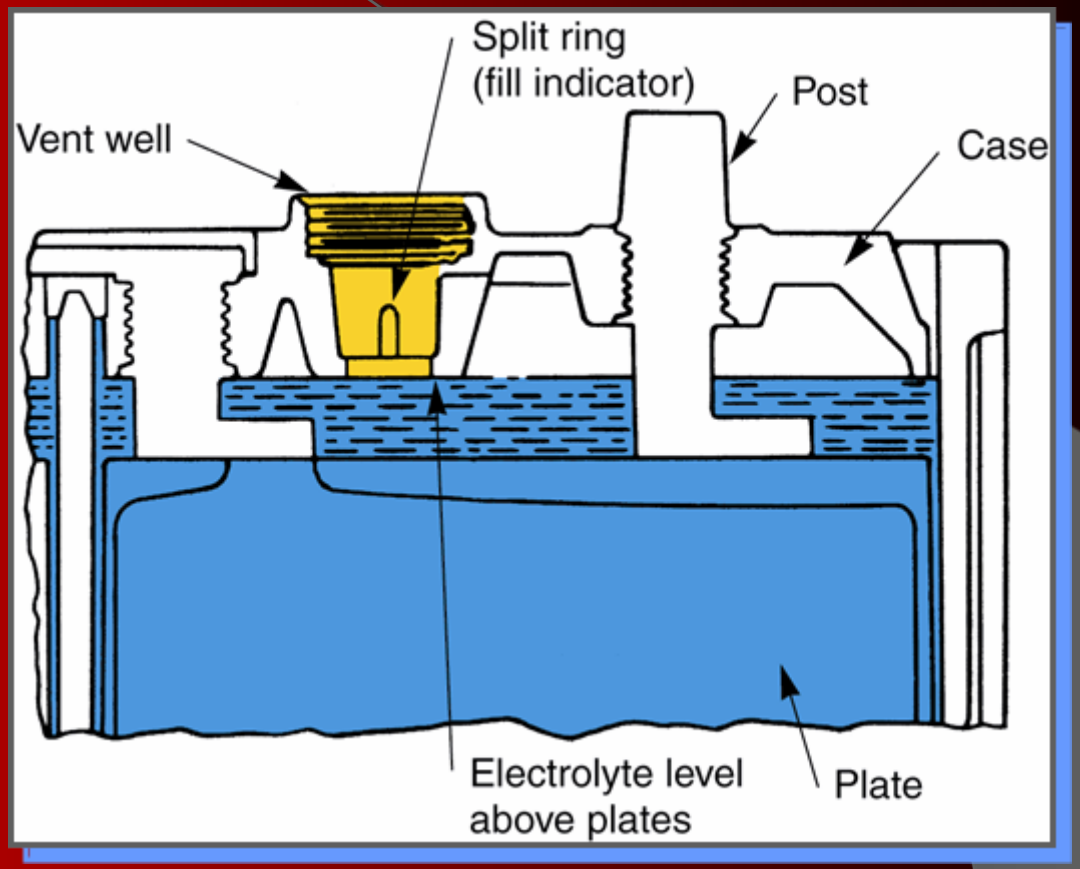
Electrolyte

Acid should just touch the split ring in the top of the case



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5. RESERVE CAPACITY RATING is the time needed to lower battery terminal voltage below 10.2 volts at a discharge rate of 25 amps.

6. The CHARGE INDICATOR provides an easy way to check battery condition.

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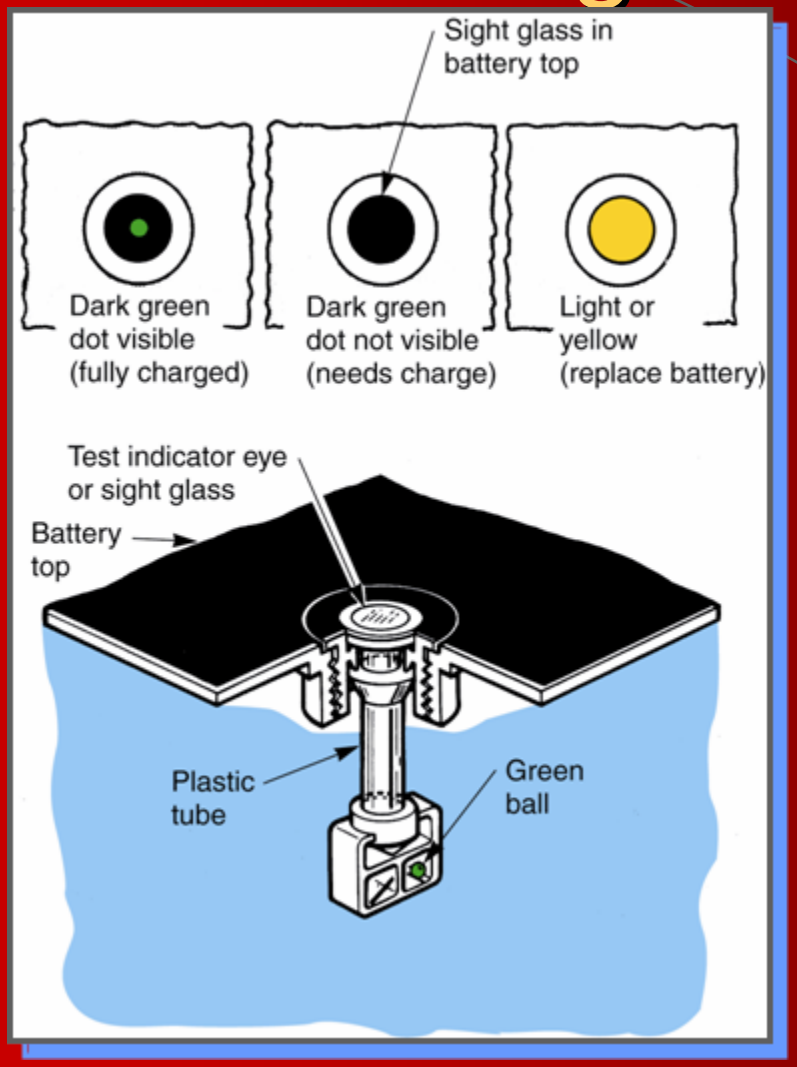
Battery Ratings

- Cold cranking rating: Determines the current that the battery can deliver for 30 seconds at 0 ºF while maintaining terminal voltage of 7.2 volts (or 1.2 volts per cell). Expressed as cold cranking amps (CCA)
- Reserve capacity rating: Time needed to lower battery terminal voltage below 10.2 volts (1.7 volts per cell) at a discharge rate of 25 amperes at 80 ºF (27 ºC). Expressed in minutes
- Amp-hour rating: Measures current that the battery could produce for 20 hours at 80 ºF with the battery voltage above 10.5 volts

Charge Indicator



Changes color to show the general state of charge of the battery

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Battery Voltage

- Open circuit cell voltage is 2.1 volts
- Cells are connected in series
- Battery voltage depends on the number of cells
- 12 volt battery has 6 cells - open circuit voltage 12.6 volts
- 6 volt battery has 3 cells - open circuit voltage 6.3 volts

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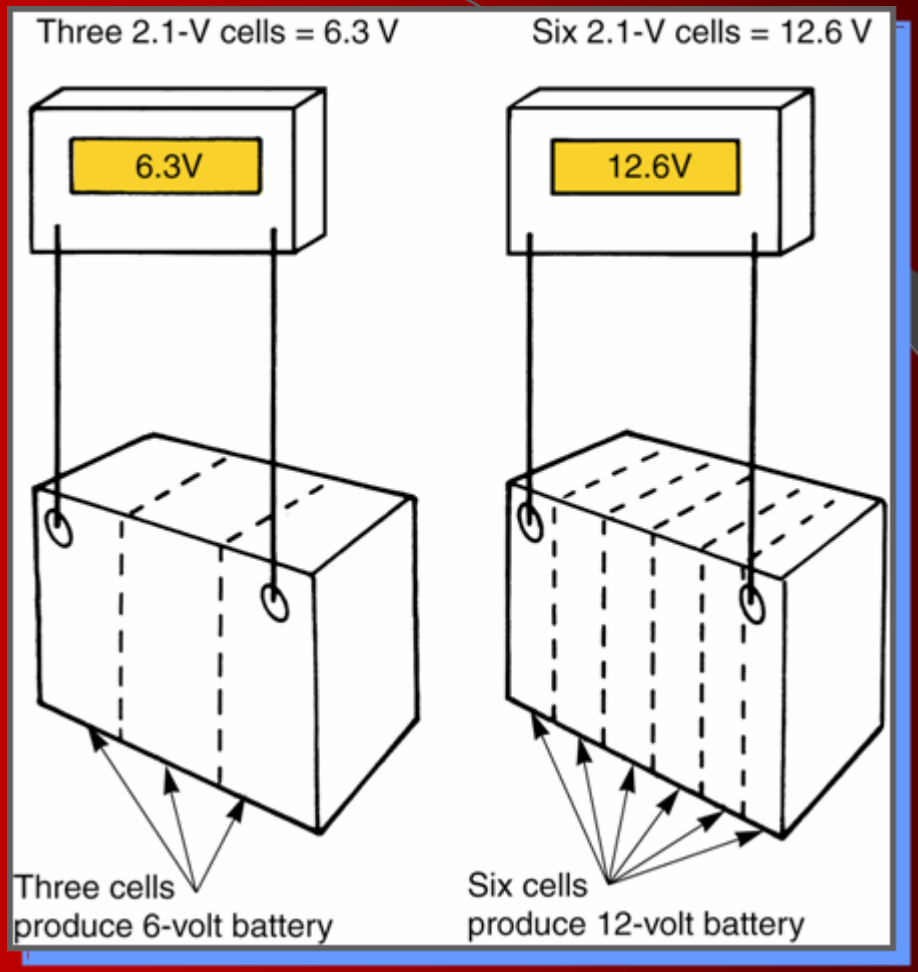
Battery Voltage



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Battery Cables

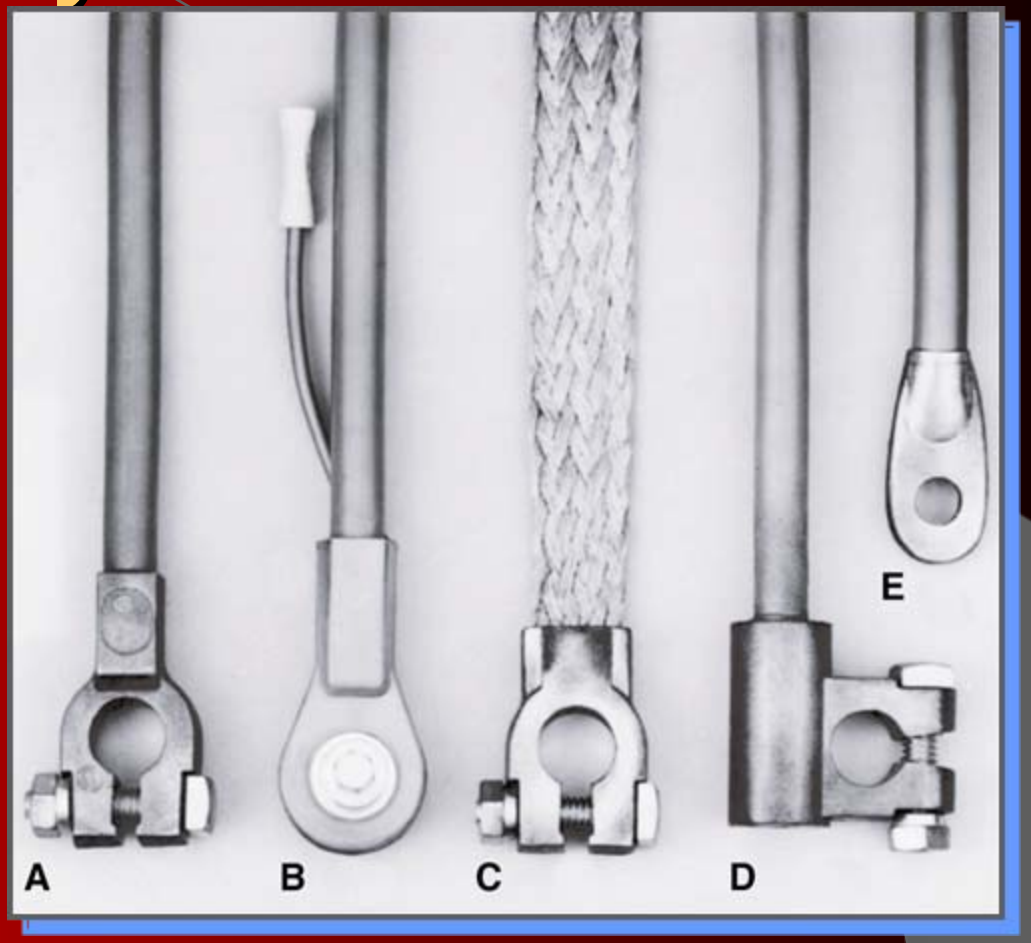
A. Post-type

B. Side terminal

C. Braided ground

D. 90º post-type

E. Solenoid to starter



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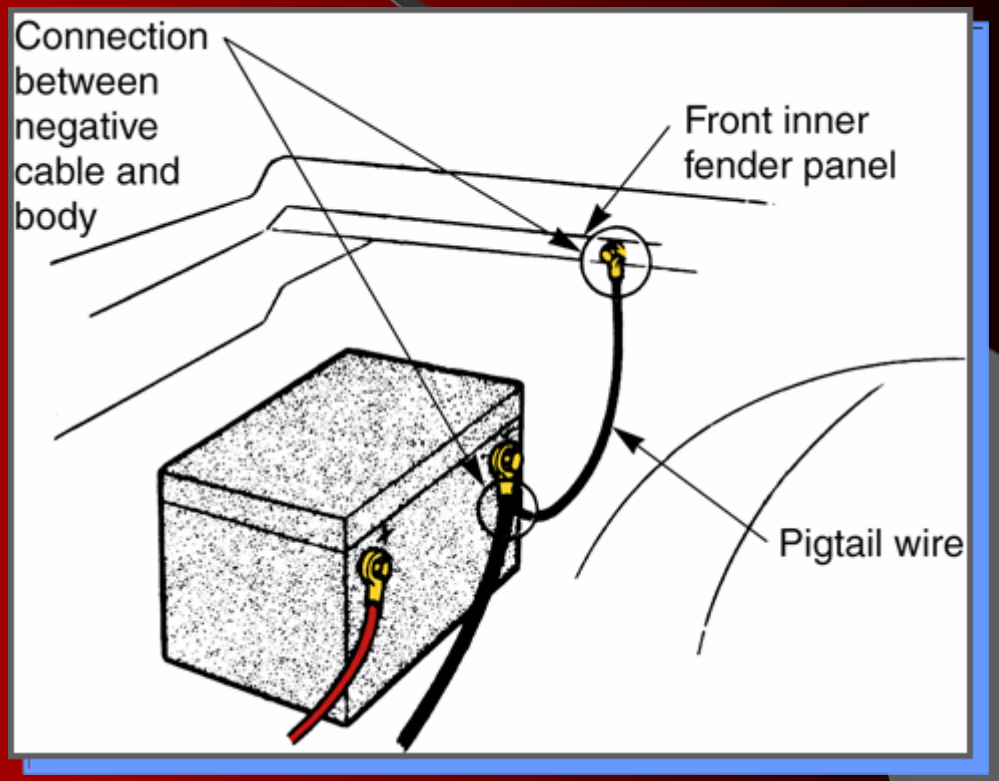
Cable Connections

Negative grounds engine block and positive connects to electrical system



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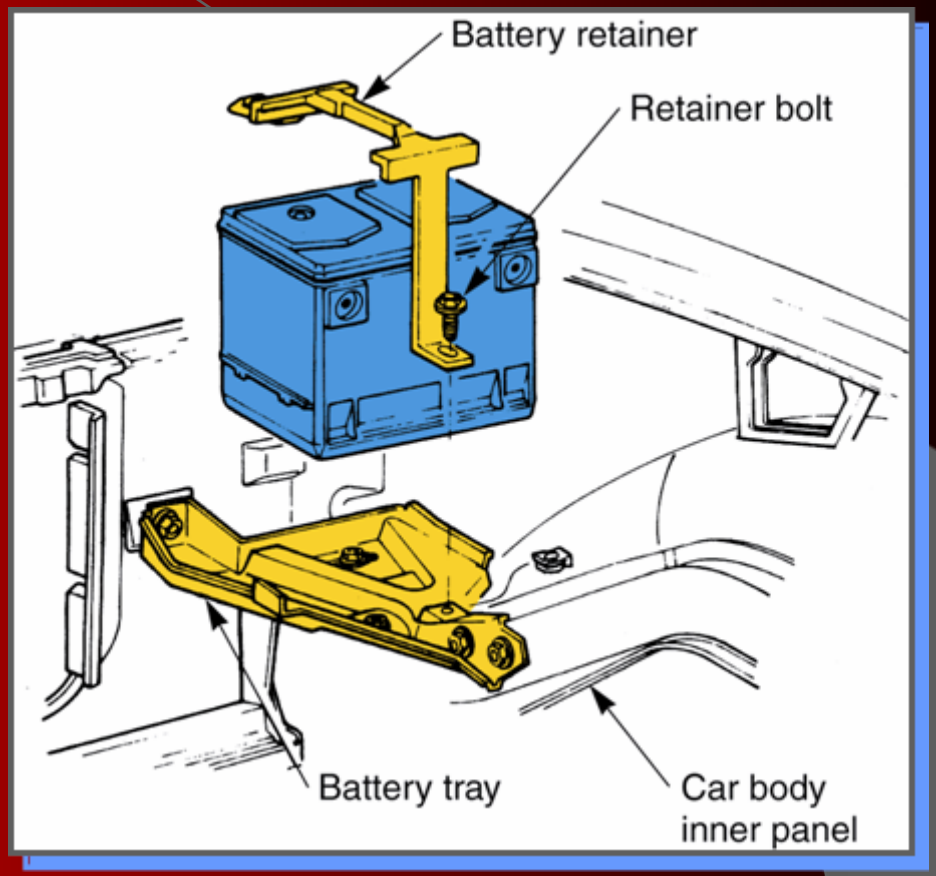
Battery Tray and Retainer

Holds battery securely in place

May house a battery temperature sensor



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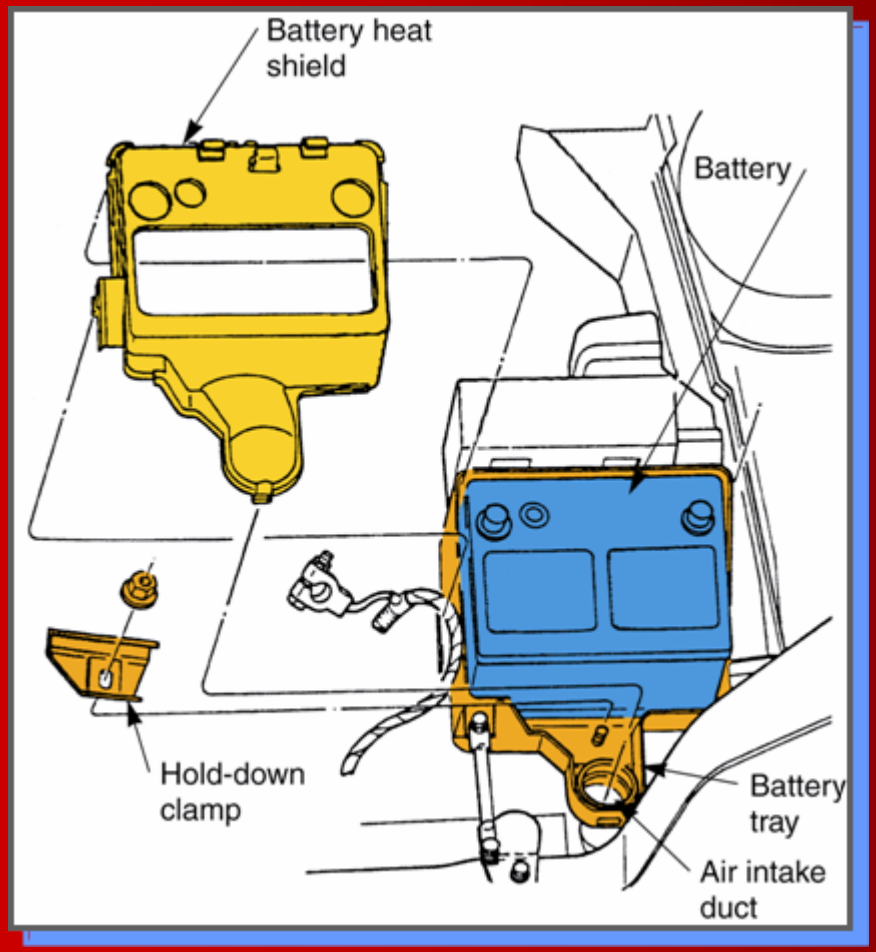
Battery Tray and Heat Shield



Protects battery from excess engine heat by routing air between heat shield and battery case

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7. DISCHARGING is when chemical energy is changed into electrical energy in the battery.

8. ELECTROLYTE is a mixture of sulfuric acid and distilled water.

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9. COLD CRANKING RATING indicates the battery's ability to crank a specific engine at a specified temperature.

10. CHARGING is takes place when electrical energy is converted into chemical energy.

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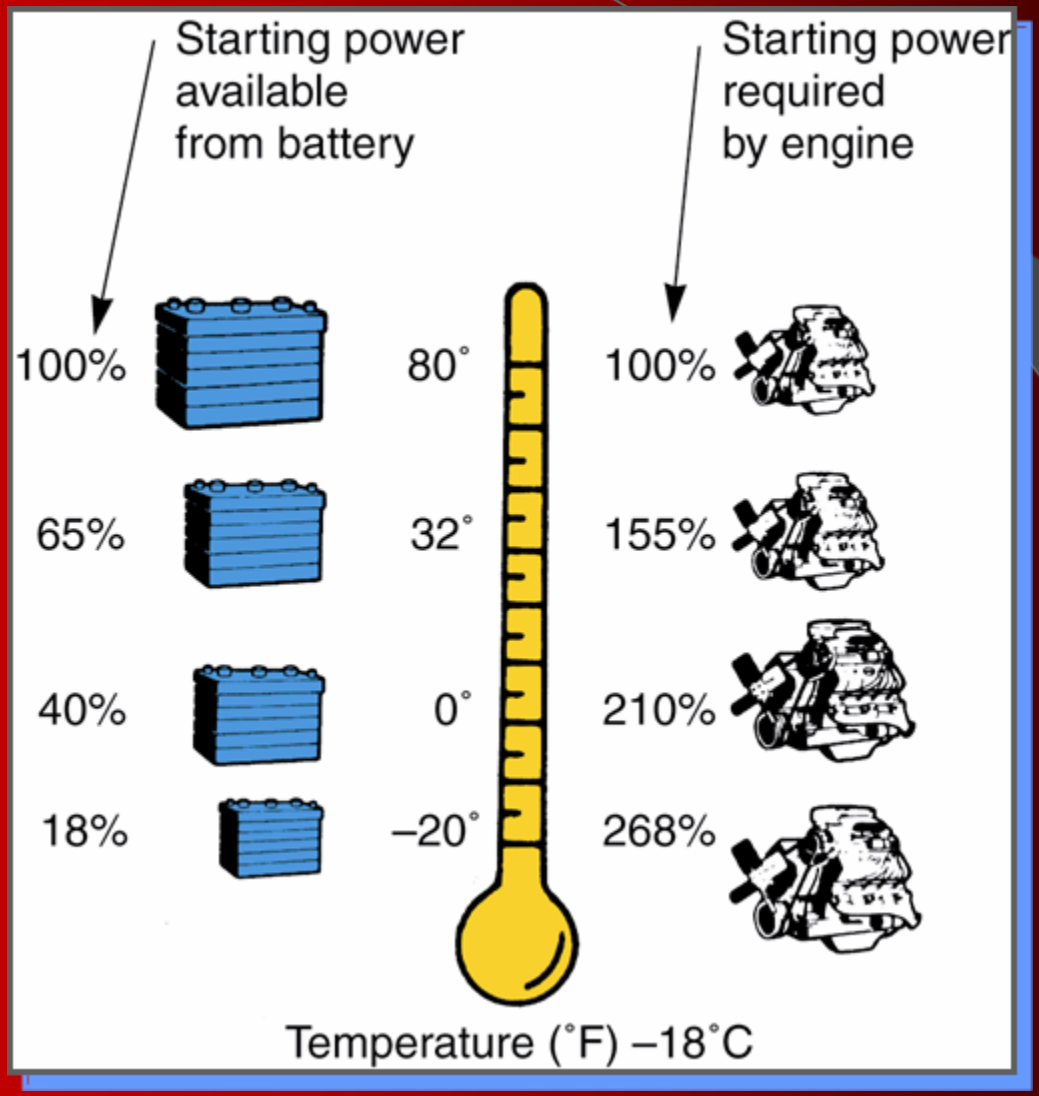
Temperature Versus Efficiency



Parasitic Loads

- Current draw present when engine and ignition are shut off
- Computers and clock require constant power
- Over prolonged periods, these may discharge the battery enough to prevent starting

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Identify the Parts of a Battery

11. Increased electrolyte capacity
12. Battery cap
13. Sealed vent caps
14. Test eye indicator
15. Terminal (post type 16. Battery case
17. Battery hold down
18. Cell divider
19. Element 20. Cell compartments