





Automotive Battery



SAFETY and SPECIAL HANDLING

The acid, water and explosive hydrogen gases can cause **serious injury** to skin and eyes.

! DANGER / POISON

 <p>SHIELD EYES EXPLOSIVE GASES CAN CAUSE BLINDNESS OR INJURY</p>	 <p>NO • SPARKS • FLAMES • SMOKING</p>	 <p>SULFURIC ACID CAN CAUSE BLINDNESS OR SEVERE BURNS</p>	<p>FLUSH EYES IMMEDIATELY WITH WATER</p>  <p>GET MEDICAL HELP FAST</p>
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KEEP OUT OF THE REACH OF CHILDREN. DO NOT TIP. KEEP VENT CAPS TIGHT AND LEVEL.







Automotive Battery

Safety

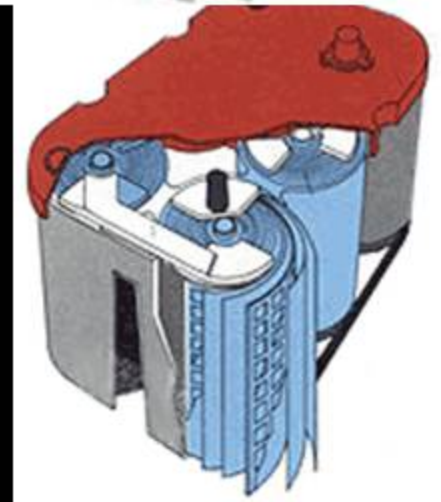
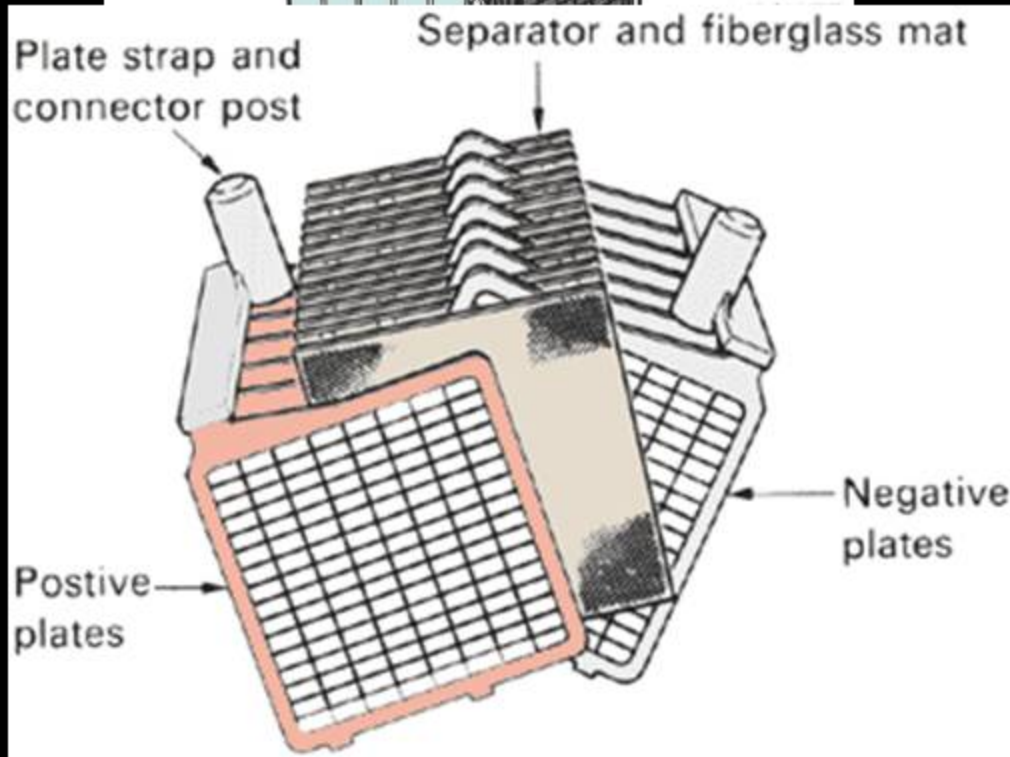
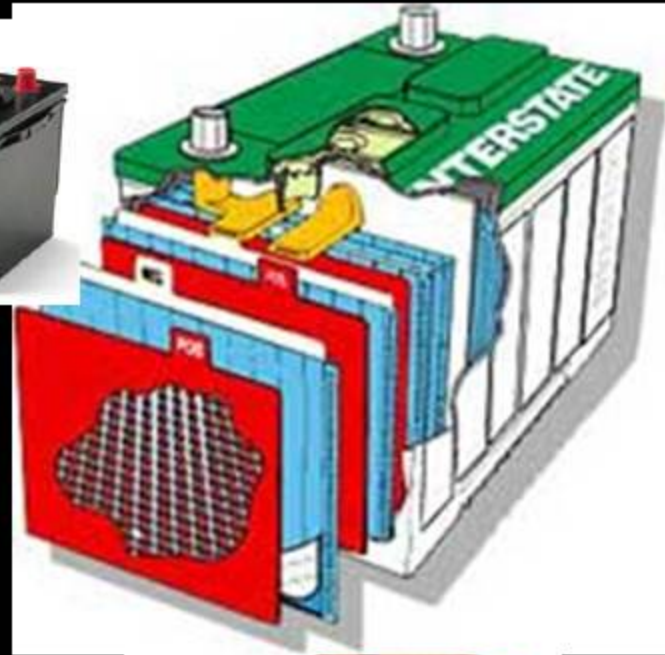
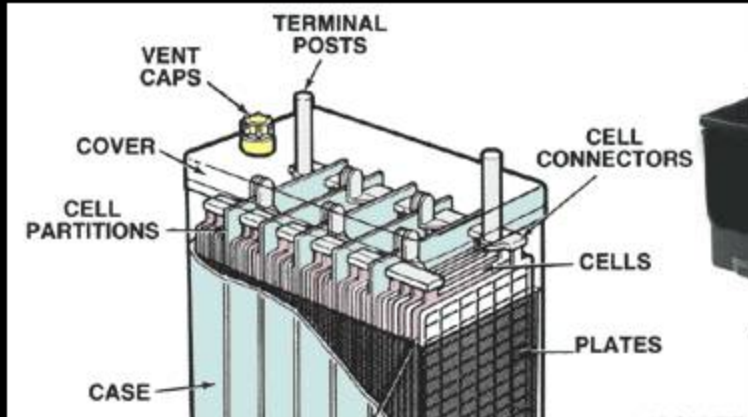
Inspection

Tools and Testing

Charging

Boosting

Automotive Battery



SAFETY

Wear **protective** goggles, gloves and clothing.



Have available **large quantities** of water.



Provide **good ventilation**.



Keep **sparks and flames** away.



Seek **medical attention** if needed.



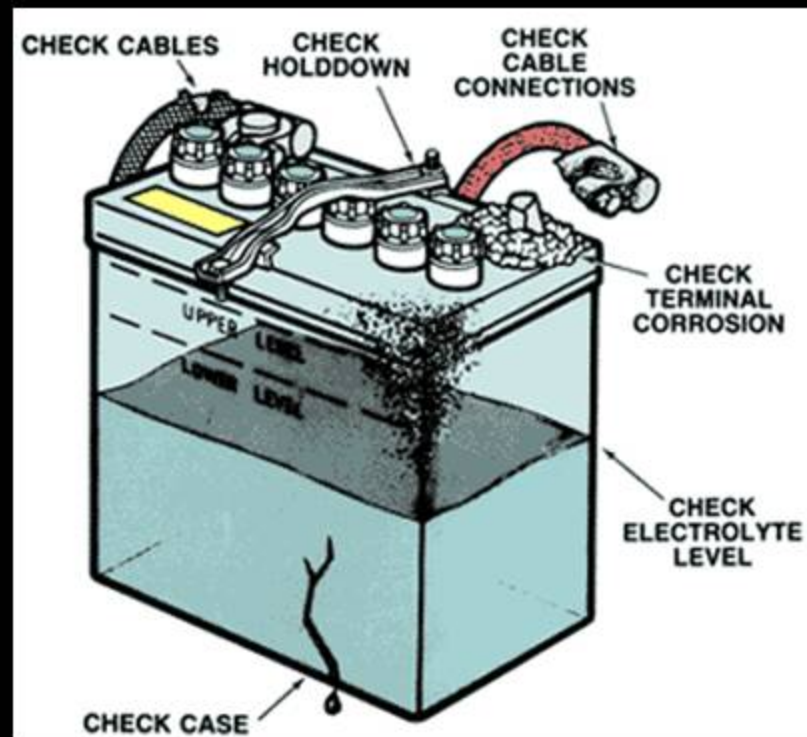
VISUAL INSPECTION

Cracks in the battery case and broken terminals

Cracked or **broken cables** or connections.

Corrosion on terminals and dirt or acid on the case top.

Loose battery hold-down or cable connections.



VISUAL INSPECTION

Check the **electrolyte** fluid level.

Check for cloudy or **discolored** electrolyte.



ADDING WATER

Distilled water is preferred *but...* because minerals and chemicals found in drinking water react with plate material and shorten battery life.

Correct level is 1/8 inch above bottom of the vent well.

Electrolyte level should **never go below** the top of the plates.

Avoid overfilling to prevent loss of electrolyte.



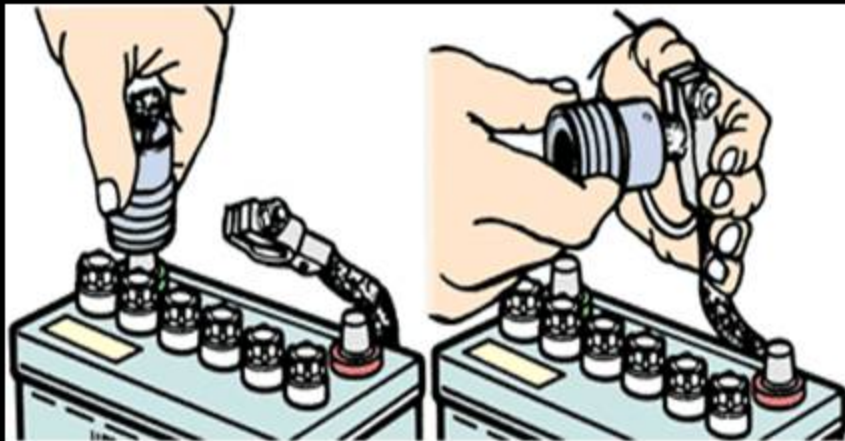
BATTERY TERMINAL CLEANING

Corrosion adds resistance and lowers current flow.

Clean with a mild solution of **baking soda** and water.

Remove cables to clean posts and cable clamps.

A **battery brush** is ideal for cleaning posts and clamps.



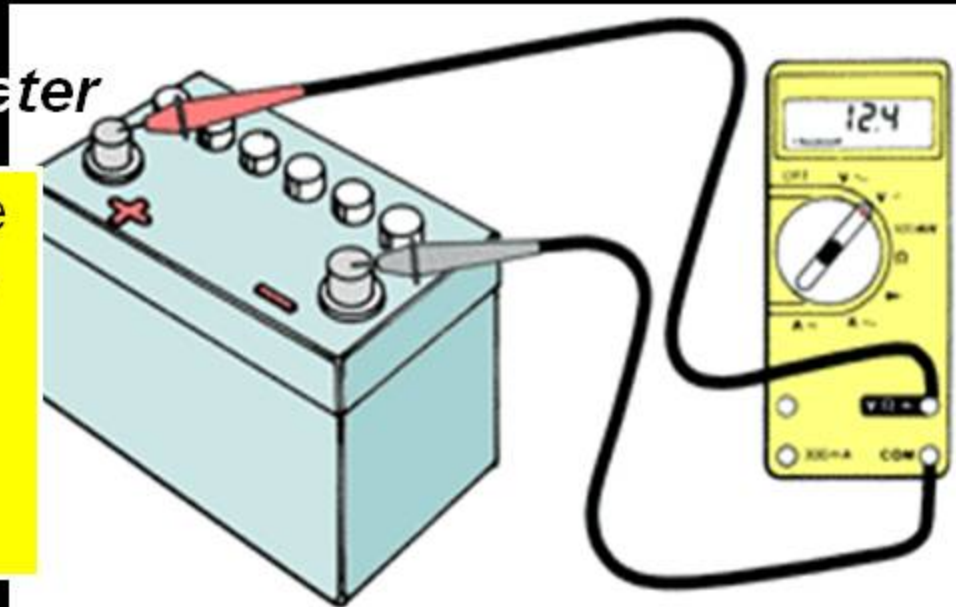
OPEN CIRCUIT VOLTAGE

Use a **digital voltmeter** and check the battery's open-circuit voltage. Turn on the headlamps for several minutes to remove any surface charge.

Turn off the headlamps and **connect the digital voltmeter** across the battery terminals.

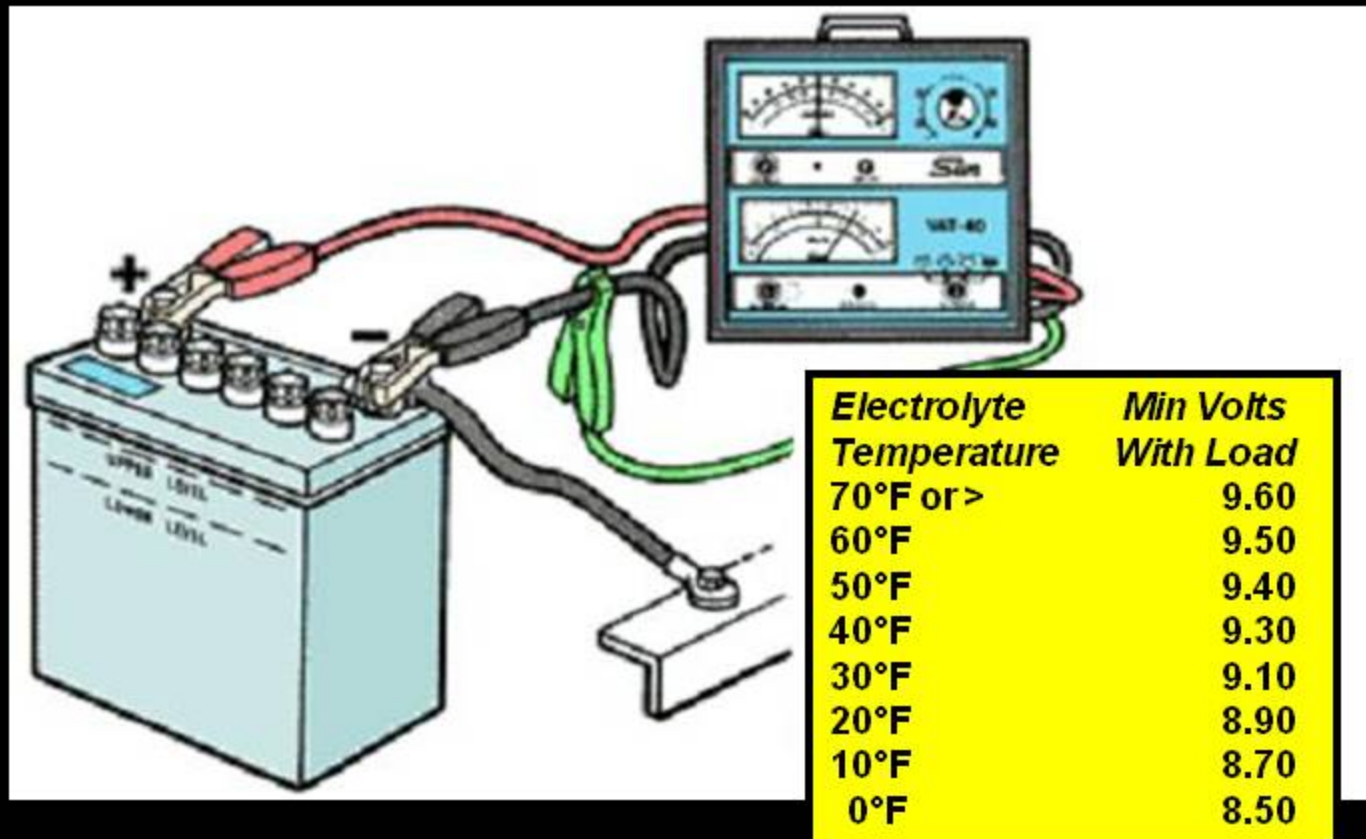
Read the Voltmeter

%	Charge
12.6v	= 100%
12.4v	= 75%
12.2v	= 50%
12.0v	= 25%
11.9v	= 0%



HEAVY LOAD TEST

A capacity or heavy-load test measures the battery's ability to deliver current. A battery load tester is used. The battery must be at least 75% charged before a heavy test can be performed.



HYDROMETER



Battery Tester



Load Tester



Digital Voltmeter



SPECIFIC GRAVITY TEST

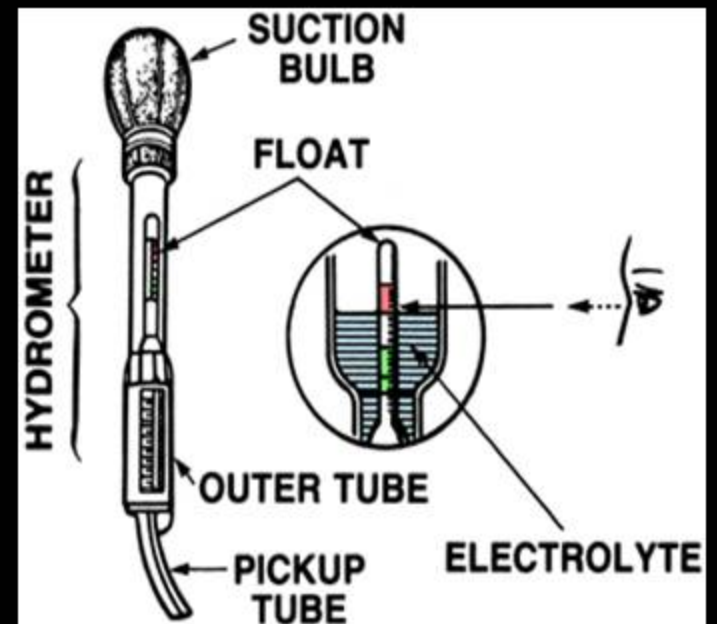
Remove **vent caps** or covers from the battery cells.

Insert the **pickup tube** into the cell closest to the battery's positive (+) terminal.

Draw in only enough **electrolyte** to cause the float to rise. Do not remove the tube from the cell.

Read the **specific gravity indicated** on the float at eye level.

Repeat the procedure for the remaining cells.



SPECIFIC GRAVITY READINGS

By measuring the specific gravity of the electrolyte, you can determine if the battery is fully charged, requires charging, or must be replaced.

1.270	100 %
1.230	75%
1.190	50%
1.145	25%
1.100	0%

BATTERY CHARGING

Make sure charger is turned **OFF**.

Disconnect the battery ground cable.

The battery is **fully charged** when there is no change in specific gravity readings for more than one hour.

A **slow charge** is always preferred.

Slow \longleftrightarrow Fast
5-10 amps 15 amps or >



Automatic Charger



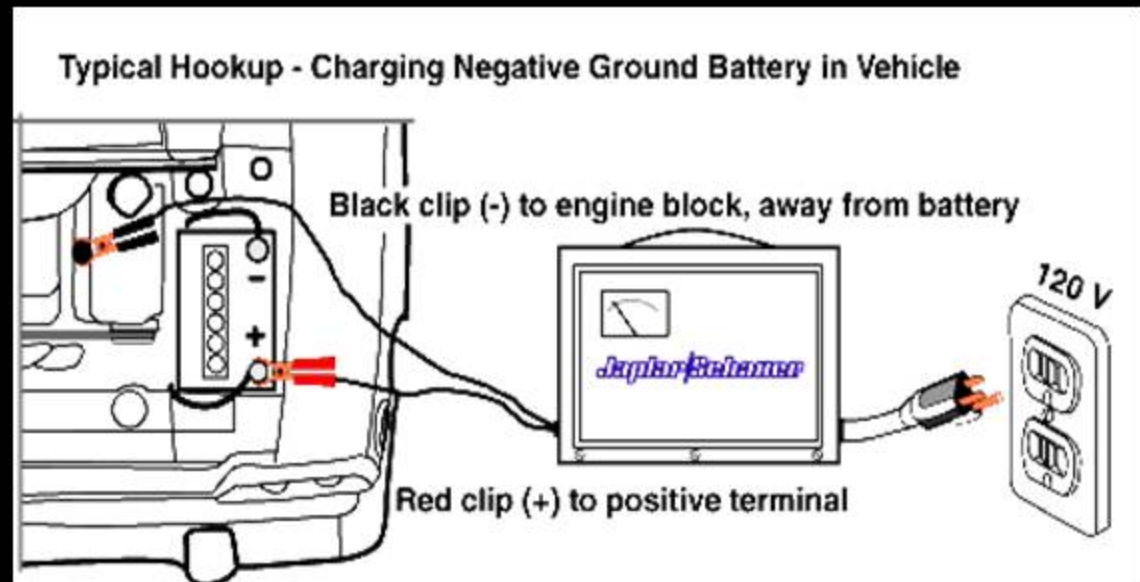
Manual Charger

RULES FOR CHARGING

1. Always leave the **vent caps** on during charging.
2. Always follow the **manufacturer's instructions**.
3. Always charge batteries in a **well ventilated** area and wear eye protection.
4. Always keep **sparks or flames** away.
5. Always **disconnect** the battery, excessive voltage can damage vehicle electrical circuits.
6. **Recheck** specific gravity readings periodically and check the battery for excessive heat.

CHARGING PROCEDURES

1. Connect the **charger's cables**.
2. **Plug in** the charger. Select a low setting for a sealed battery and a higher setting for an accessible battery.
3. Always refer to the charger manufacturer's **instruction manual**.
4. Periodically check the battery for **excessive heat**.
5. When charged **first unplug** the charger.



CAUTION

Manual chargers **do not adjust** the charging rate to the battery's level of charge and require monitoring.

Automatic chargers sense the battery's level of charge and **adjust** the charging rate to prevent problems from over charging.



Automatic

Manual



There I Fixed It

BATTERY JUMPING with Booster Cables

Jump starting a dead battery with a booster battery or battery in a car can be dangerous, so the proper sequence of connections will prevent sparks.

First, connect the two positive terminals, one from the good battery and the other to the dead battery. Next connect one end of the jumper cable to the negative terminal of the booster (Good) battery. Finally connect the other end to a good ground on the engine away from the dead battery. If a spark occurs, it won't be near the battery, thus reducing the chance for explosion. If the jump starting from another vehicle, start the vehicle, running the engine at 1500 RPM for a few minutes. While the engine is running, start the dead vehicle. Never jump start a frozen battery.

