



Battery

safety precautions*

Correct Lifting Procedure

- / Caution batteries are heavy therefore ACDelco recommends using correct lifting procedure when handling.

Use a Sealed Battery to Help Avoid Battery Acid Burns

- / Wherever possible, use a Sealed Maintenance Free Battery to all but eliminate the risk of contact with battery acid under normal conditions.
- / Use extreme care, especially when handling a conventional or a non sealed maintenance free battery as you are more likely to accidentally come into contact with battery acid / electrolyte.

If Electrolyte is Spilled

- / If electrolyte is spilled or splashed onto clothing or the body, wash with water and neutralize with a solution of baking soda and water.
- / Electrolyte splashed into eyes is extremely dangerous. If this occurs, gently open eyes and wash with cool clean water for 5 minutes. Call a doctor.

If Electrolyte is Swallowed

- / Drink lots of water or milk. Follow with milk of magnesia, beaten eggs or vegetable oil. Call a doctor.

Preparing Electrolyte

- / Using rubber gloves is a good idea when handling a battery, a must when handling electrolytes.
- / Always add the concentrated acid to the water never add water to the acid.

Electrolyte Storage

- / Electrolyte should be stored in plastic containers with a sealed cover. Do not store in the sun or near any other heat source.

Explosive Risk

- / Batteries generate explosive gases during operation and when charged. Keep batteries away from flames, sparks, burning cigarettes or other ignition sources.
- / Avoid placing any metallic objects on top of the battery as it could cause shorting.

Ventilate and Protect Your Eyes

- / When charging batteries, always shield eyes and work in a well-ventilated area never in a closed room.

Disconnection Safety

- / Always turn battery charger or ignition off before disconnecting a battery.

Battery Charging Safety Precautions

- / Please refer "Recharging Batteries" on page 15.

*ACDelco recommends you wear appropriate protective clothing and safety glasses when handling batteries.



Checking batteries*

All Types

- / Is the battery loose or tight in the carrier?
- / Loose batteries can fail due to prolonged vibration.
- / Does the battery look damaged or mishandled?
- / This can also cause failures.

Apply the Headlight Test

- / Park near a wall or outside a garage door after dusk.
- / Turn the engine off and put the hand brake on.
- / Turn on the headlights - if bright, the battery is OK.
- / If the headlights are dim, start the engine (making sure the car is in park or neutral).
- / If the lights brighten up with the engine on, the battery is bad and needs replacing.

Voltmeter Test

- / You may also use a voltmeter to check the battery's voltage.
- / A normal fully charged battery should read around 12.5 to 13.5 volts.
- / If the battery is under 12.5 volts, recharge the battery.

Volt-Ohmmeter Test

- / If the battery tests OK but isn't quite holding a charge, check the alternator drive belt.
- / If the drive belt is tight, test the voltage regulator using a volt-ohmmeter according to the manufacturer's instructions or the vehicle owner's manual.

ACDelco SEALED MAINTENANCE FREE BATTERY



Read the Inbuilt Hydrometer

- / On top of the battery you'll find the inbuilt hydrant charge indicator - look into it.
- / If there is no light, it usually means there is no charge in the battery - it's flat.
- / If you see a coloured light, review the label near the charge indicator for details on how charged or otherwise your battery is based on the colour of the light.

*ACDelco recommends you wear appropriate protective clothing and safety glasses when handling batteries.



Checking batteries* (continued)

LOW MAINTENANCE ACCESSIBLE BATTERIES

Is the Electrolyte Below the Tops of the Separators?

- / This indicates overcharging or poor maintenance.
- / Overcharge condition may be due to incorrect voltage setting, low voltage caused by heat or internal defects, or batteries of an old age.

Is Any Electrolyte on the Top of the Battery?

- / This can indicate overcharging or overfilling.

Check Hydrometer Reading

- / A low specific gravity reading of 1.220 or less in all cells indicates a flat (discharged) battery.
- / It must be charged before further examination and testing can occur.
- / The battery may be flat due to problems in the electrical system (e.g.: slipping alternator belt, poor voltage regulator, faulty alternator, or high resistance due to corrosion).
- / The battery may be shorting internally due to manufacturing defects, or shorts through the ageing process or vibration damage.



Understanding battery terminology

Reserve Capacity

Number of minutes a new, fully charged battery can be discharged at 25 amps and maintain a terminal voltage higher than 1.75 volts per cell at 27 °C.

Cold Cranking Amps (CCA)

The current that a, fully charged battery can deliver for 30 seconds and maintain a terminal voltage greater than or equal to 1.2 volts per cell at -18 °C.

Cycle Life

Number of charge / discharge cycles a battery can endure before it loses its ability to hold a useful charge (highly dependent on depth of discharge).

Amp Hour Capacity

The ability of a fully charged battery to deliver a specified quantity of electricity at a given rate over a period of time.

*ACDelco recommends you wear appropriate protective clothing and safety glasses when handling batteries.



Battery

installation guidelines

General Precautions

- / Wear appropriate protective clothing and safety glasses.
- / Before removing an old battery, make sure the engine, lights and all accessories are turned off.
- / Check if vehicle has a computerized electrical system. If so, an alternative power source to maintain electronic memory when battery is disconnected may be required (to avoid damage to the main computer or other segments of the vehicle's electronically controlled equipment).
- / Check if vehicle has air bags fitted. If so, see following...

Safety Precautions for Vehicles Fitted with an Air Bag

- / Always check to ensure that the ignition is **off** before removing either of the battery terminals.
- / Don't sit behind the steering wheel or in other seats with an air bag while any electrical service work is carried out on the vehicle.
- / Removing or replacing battery terminals will not unintentionally trigger an air bag system, however removal of battery terminals with the ignition on can cause damage to electronic components, including the air bags - so don't do it.
- / If you need to work on the electrical system beyond replacing the battery, you must electrically disable the air bag system first.
- / Never indiscriminately probe the electrical wiring / connectors in or near the steering column.
- / Most air bag systems use bright yellow wiring and harness connectors - do not interfere with any harness of this colour.

Removal of Old Battery

- / Note location of positive (+) terminal and mark polarity on positive cable.
- / Remove the negative or earth (-) terminal first to avoid damaging the wiring or battery by accidentally grounding tools.
- / Remove second (+) terminal.
- / Undo the hold-down clamp and remove old battery, noting position of terminal posts.

New Battery Installation

- / Inspect tray and area for corrosion and replace or repair as necessary.
- / To clean tray, scrub the area with water and baking soda (sodium bicarbonate), then rinse with water.
- / Dry and paint corroded steel parts with acid proof paint.
- / Clean and brush terminals.
- / Check cable and starter motor connections tighten if necessary.
- / Replace terminal clamps and / or cables if badly corroded.
- / Sit the new battery in the tray ensuring it's level and that the terminal posts are correctly positioned.
- / Secure battery with hold-downs, tightened to ensure battery can't move in the tray.
- / Apply a thin coating of high temperature grease to the posts and cable connections.
- / Replace cables ensuring that the earth (-) terminal is connected last.
- / Tighten connections but don't over tighten.
- / Never hammer cable connections onto battery posts as this can damage your battery.



Recharging batteries*

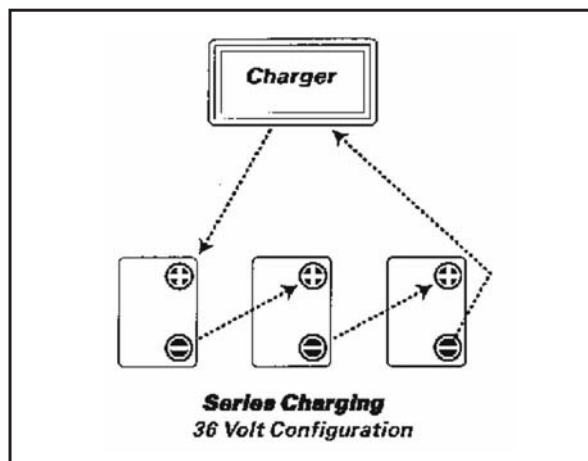
Safety Precautions

- / Before you attach, rock, or remove terminal clamps, you **MUST** turn the charger off.
- / Charge in well ventilated area away from open flames or sparks.
- / Ensure vent caps are in place.
- / Follow the battery charger manufacturer's instructions.

Charging Times

Charging rates or times will vary due to a number of other features such as:

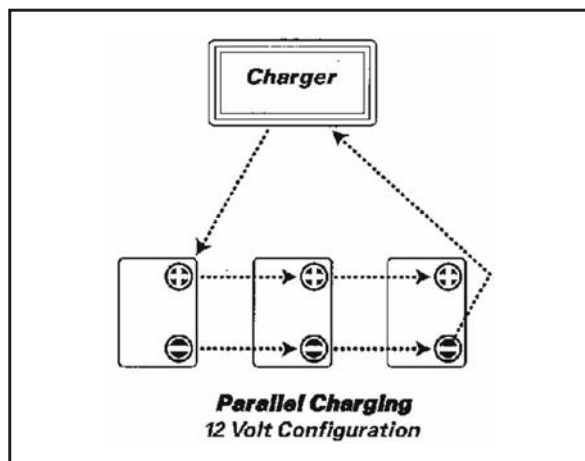
- / The electrical capacity of the battery.
- / Temperature of the electrolyte.
- / Battery state of charge at the start of the charging period.
- / Battery age and condition.



- / Set the charger to maintain a charging rate of 5 to 10 amps.
- / Monitor each battery every 30 to 60 minutes for spewing, gassing, temperatures above 61 °C or charging voltage above 16 volts. If any of these occur, remove and test the battery.
- / Check the charger indicator on each battery hourly for a green dot, gently shake the battery, as necessary. If a green dot is not visible, continue charging. When a green dot appears and remains, the battery is charged.
- / Turn off the charger and disconnect any recharged battery. Remove it from the series and load test it.
- / Reconnect the remaining batteries in series and continue charging.

Notice:

When batteries are removed from series charging, readjust the charger to maintain proper charging current rate for the remaining batteries.



- / Set the charger to the highest setting.
- / Adjust the charger so the measured voltage does not exceed 16 volts.
- / Monitor batteries every 30 to 60 minutes for spewing, gassing and temperatures above 52 °C; if any of them occur, remove the battery with this condition and test it.
- / Check the hydrometer on each battery hourly for a green charge indicator, gently shaking the battery, as necessary. If a green charge indicator is not visible, continue charging. When a green charge indicator appears and remains, the battery is charged.
- / Turn the charger off.

- / Disconnect all batteries when the charge indicator is green.
- / Continue recharging all remaining uncharged batteries.

*ACDelco recommends you wear appropriate protective clothing and safety glasses when handling batteries.

Battery

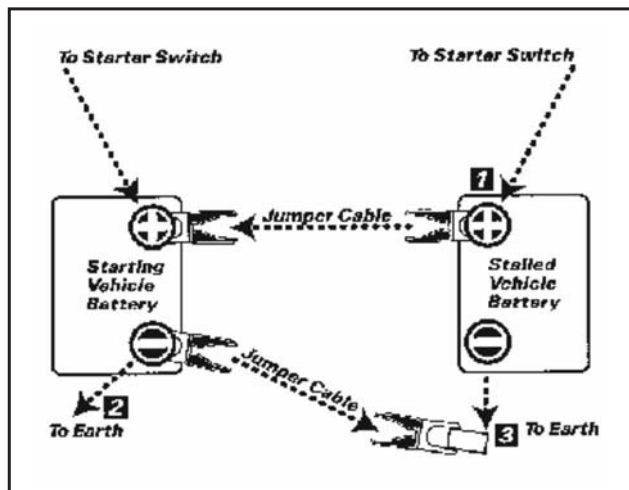
general jump starting procedure*

INITIAL CHECKLIST

- / Check batteries are the same voltage.
- / Turn off the engines and all electrical loads.
- / Make sure vehicles aren't touching.
- / Ensure vehicles are in park or neutral (with handbrake on).
- / Make sure vehicles have the same terminal earthed. If not, check manufacturers instructions.
- / Ensure cables aren't frayed or damaged.

Do the Following Steps in Sequence

1. On a negative grounded system, connect both ends of one cable to the positive (+) terminal on both batteries.
2. Connect an end of the other cable to the negative (-) terminal of the booster battery.
3. Connect the other end of the same cable away from the battery, to the engine block or frame of the vehicle to be started.
4. Make sure both cables are clear of fan blades and other moving parts.
5. Start the engine of the booster car.
6. Attempt to start the engine of the vehicle with flat battery.
7. If vehicle does not start within 30 seconds, call an auto electrician.
8. After starting, remove cables in reverse order, starting with the cable connected to engine block or frame.



Warning:

Do not jump start modern vehicles with electronic management systems without “protected” jump starter leads. You must also refer to the owner's handbook for vehicle-specific procedures.

*ACDelco recommends you wear appropriate protective clothing and safety glasses when handling batteries.