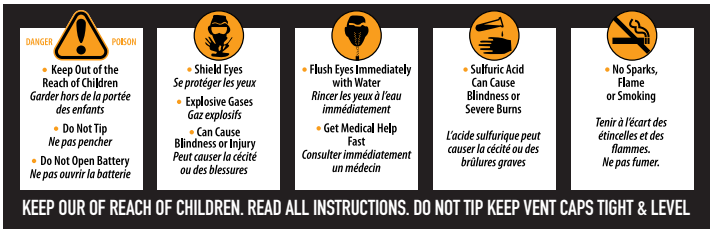
Automotive Battery Care & Maintenance



1. SAFETY PRECAUTIONS



WARNING:
RISK OF FIRE, EXPLOSION OR BURN, DO NOT DISASSEMBLE OR INCINERATE. NOT RECOMMENDED FOR INVERTED USE. FOLLOW PROPER CHARGING INSTRUCTIONS.

FOLLOW ALL SAFETY INSTRUCTIONS WHEN HANDLING BATTERIES! ALWAYS WEAR EYE PROTECTION.

Safety glasses and a face shield when working on or near batteries. All batteries generate explosive hydrogen gas. Keep sparks, flames and cigarettes away from batteries at all times. Do not connect or disconnect "live" circuits. To avoid creating sparks, always turn charging and testing equipment off before attaching or removing clamps.

Always disconnect ground cables first and connect it last to prevent dangerous sparks. Batteries contain corrosive sulfuric acid that can destroy clothing and burn the skin. Neutralize acid spills with a paste made of baking soda and water or large quantities of water. baking soda, soda ash or lime. Be careful!

2. IN-VEHICLE SERVICE & TESTING

FOLLOW SAFETY PRECAUTIONS - WEAR PROPER EYE PROTECTION!

Prior to any testing, visually inspect the battery. Look for:

- Cracked or broken case or cover
- Loose cable connections
- Leaking case-to-cover seal
- Corrosion
- Damaged or leaking terminals

Neutralize any corrosion with a baking soda/water paste or battery cleaner spray. Scrape or brush off the residue and wash the area with clean water. Following your visual inspection, check the battery's state of charge with a voltmeter.

You must boost charge a weak battery before load testing. (See charging chart under "Charging Tips" section.) If fully charged, perform a load test.

PROTECT YOUR EYES!

3. CONDUCTANCE TESTING

Conductance uses the battery's response to a very small signal in an attempt to predict the effects of a much larger current. Conductance testing is ineffective on a discharged battery. If the battery is known to be discharged or if the tester tells the operator to charge before testing again, the battery must be completely recharged.

1. It may not be required to turn a conductance tester off or on. If off, you must turn on immediately when connected to a battery. Most will turn off automatically if ignored long enough. Some have no battery of their own and get all their power from the battery being tested.
2. Connect the positive (+) tester clamp to the positive (+) battery terminal. Then connect the negative (–) tester clamp to the negative (–) battery terminal. If the battery has more than one pair of terminals (e.g. top posts and side terminals) always perform the testing on the terminals that are used in the vehicle. Use the proper charging adapters for stud or side terminal batteries. Never connect tester to a bolt or stud.
3. Turn on if needed. Enter the requested information. Be sure to distinguish between a CCA rating and a CA or MCA rating. If no rating is available, use the minimum O.E. battery CCA requirement of the vehicle.
4. If the tester says to replace a battery that was tested in the vehicle, repeat the testing after removing the cables and cleaning the posts.

FOLLOW SAFETY PRECAUTIONS- WEAR PROPER EYE PROTECTION!

4. LOAD TESTING

First perform an open circuit voltage test, then an adjustable load test. A load test is the best way to determine if the battery is delivering adequate electrical performance. Make sure your variable load tester is working properly.

FOLLOW SAFETY PRECAUTIONS- WEAR PROPER EYE PROTECTION!

1. You can't load test a discharged battery. If the voltage is below 12.4, be sure to completely charge it before continuing. Refer to the charging chart under "Charging Tips" section for important information.
2. To avoid sparking and explosive gasses, be sure load tester is OFF and battery is disconnected before hook-up. Use computer memory saver to retain the vehicle's electronic memory while the battery is disconnected.
3. Connect the positive (+) tester clamp to the positive (+) battery terminal. Then connect the negative (–) tester clamp to the negative (–) battery terminal. Always protect your eyes.
4. Set the tester for one-half the battery's 0°F cold crank rating and apply the load for 15 seconds. (If the CCA rating is unknown, use 1/2 of the minimum O.E. battery CCA requirement of the vehicle.)
5. Estimate the internal temperature of the battery to the nearest 10°F. Apply the load for 15 seconds. Note the voltage at 15 seconds with the load on and immediately shut the load off. A reading at least equal to the value from the chart beside indicates a good battery.
6. If the battery did not meet the required voltage and if it was not charged in Step 1, completely recharge the battery and repeat the test. If it still fails to meet requirements, replace the battery.

BATTERY TEMPERATURE	12-VOLT BATTERY	6-VOLT BATTERY
70°F (21°C) or +	9.60	4.80
60°F (16°C)	9.50	4.75
50°F (10°C)	9.40	4.70
40°F (4°C)	9.30	4.65
30°F (–1°C)	9.10	4.55
20°F (–6°C)	8.90	4.45
10°F (–12°C)	8.70	4.35
0°F (–18°C)	8.50	4.25

5. CHARGING TIPS

FOLLOW SAFETY PRECAUTIONS- WEAR PROPER EYE PROTECTION!

1 To avoid a battery explosion, never attempt to charge a frozen battery. Allow it to warm up and thaw out at room temperature before placing on charge.

2 Warning: Gel and AGM (Absorbed Glass Mat) batteries require a voltage-limited charger. Charging a Gel or AGM battery on a typical shop charger that exceeds 15.4 volts – even one time – may greatly shorten its life.

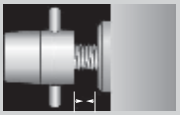
3 Important: Never overcharge batteries. Excessive charging will shorten battery life.

SIDE TERMINAL CHARGING POST





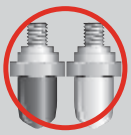
FULLY TIGHTEN FOR COMPLETE LEAD-TO-LEAD CONTACT



BATTERY BOLTS



BOLT EXTENDERS



Group 31 stud post adapters and Side Terminal Charging Posts should be used to ensure the best testing and charging results for stud terminal and side terminal batteries. The charging posts will provide a flush lead-to-lead contact. Be sure to tighten the charging post until it is snug and secure. This will allow a strong current to pass from the charging post to the battery terminal.

DO NOT USE Battery bolt extenders, battery bolts or the threaded stud terminal for testing or charging batteries. They do not provide the necessary lead-to-lead contact, and can reduce your cold cranking amperage (CCA) and state of charge readings. Batteries should be boost charged if the open circuit voltage (voltmeter) reading is below 12.4 volts. See charging chart below.

4 Prior to charging, read the manufacturer's instructions for proper charger hook-up and use.

5 Turn charger off prior to hook-up to avoid dangerous sparks. PROTECT YOUR EYES!

6 WARNING: If the electrolyte is accessible, verify that plates are covered before beginning to charge. At the end of charge, add distilled water as needed to bring levels to the proper height. If water is added, charge for an additional 30 minutes to mix. If electrolyte levels are low, but battery is not accessible, remove battery from service.

7 The maximum charge rate in amperes should be no more than 1/3 of the battery's reserve capacity minute rating. If the terminal voltage exceeds 16.0 volts while charging, reduce the charge rate.

8 Continue charging and reduce the rate as needed until a two-hour period results in no increase in voltage or decrease in current.

9 If violent gassing or spewing of electrolyte occurs, or the battery case feels hot to the touch, temporarily reduce or halt charging.

VOLTAGE			STATE OF CHARGE	Approximate battery charging rate and time to charge a full size 70 Ah automotive battery*				
FLOODED		AGM		CHARGER MAXIMUM RATE				
6 Volt	12 Volt	12 Volt		50 Amps	30 Amps	20 Amps	10 Amps	2 Amps
				FULLCHARGE (MINUTES/HOURS)				
6.3	12.6	12.8 V	100%					
6.2	12.4	12.6 V	75%	20 M	35 M	48 M	90 M	7.5 H
6.1	12.2	12.3 V	50%	45 M	75 M	95 M	180 M	15 H
6.0	12.0	12.0 V	25%	65 M	115 M	145 M	280 M	22.5 H
5.9	11.8	11.8 V	0%	85 M	150 M	195 M	370 M	30 H

IMPORTANT: Never over charge batteries! Excessive charging will shorten battery life.

* Charging time depends upon battery age, temperature, capacity, and efficiency of charger.

Agm 12-volt battery charging considerations:

Ideal charging varies by application. Many common battery chargers are not fully compatible with AGM batteries, however; they will not ruin the battery if used a few times over the battery's lifetime in a vehicle.

Adversely, not all chargers are really AGM compatible and can do significant damage to an AGM battery. Large "wheeled chargers," found in many shops, which exceed 15.4 volts must be avoided. In the rare occurrence that an AGM battery needs to be charged outside of the vehicles charging system, charging voltage should be 13.8 –14.8 @ 77°F (25°C). Not to exceed 30 AMPS.

6. ROTATE BATTERY STOCK

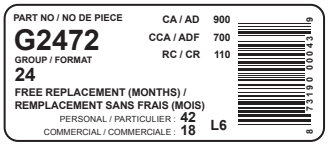
Use oldest batteries first.

Batteries require periodic stock rotation and routine charging. Always rotate stock using the **FIFO** (First In, First Out) method...NOT FISH (First In, Still Here).

Date Code Example: (refer to chart)
L2 – Battery shipped November 2012
Always use oldest batteries first.

REMEMBER...WET OR DRY, ALWAYS ROTATE YOUR STOCK!

SHIPPING DATE CODE	
MONTH	
A	January
B	February
C	March
D	April
E	May
F	June
G	July
H	August
J	September
K	October
L	November
M	December
YEAR	
5	2015
6	2016
7	2017
8	2018



Month
Year
= November 2016

7. BATTERY STORAGE TIPS

- Batteries should be stored in a cool, dry area in an upright position.
- Never stack batteries directly on top of each other unless they're in cartons.
- Do not stack more than 3 high (2 high if battery type is heavy commercial).
- Test wet batteries every 4–6 months and recharge if necessary.
- Always test and charge if necessary before installation. (See "Charging Tips" section)

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