AUTOMOTIVE BATTERIES

7. WHAT DO I LOOK FOR IN BUYING A NEW BATTERY?

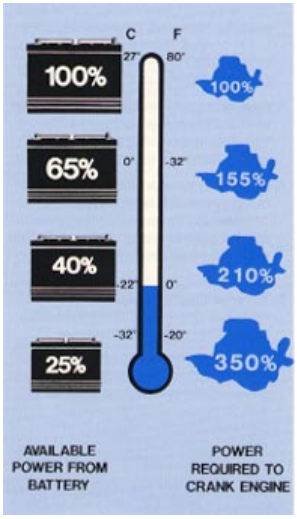
Battery buying strategy for use in Canada, for example, is different than in the hot climates found in Texas or Arizona. In the colder climates, higher CCA ratings are more important. In a hot climate, higher RC ratings are more important than CCA; however, the CCA rating must be satisfied and match or exceed your car's OEM (Original Equipment Manufacturer) cranking amp requirement.

7.1. Cold Cranking Amps (CCA)

The most important consideration is that the battery's CCA rating MEETS OR EXCEEDS, your car's OEM cranking requirement in your climate. *CCAs are the discharge load measured in amps that a new, fully charged battery, operating at 0 o F (-17.8 o C), can deliver for 30 seconds and while maintaining the voltage above 7.2 volts. Batteries are sometimes advertised by their Cranking Performance Amps (CA), Marine Cranking Amps (MCA) measured at 32o F (0 o C), or Hot Cranking Amps (HCA) measured at 80 o F (26.7 o C). These measurements are not the same as CCA. Do not be misled by CA, MCA or HCA ratings. To convert CAs to CCAs, multiply the CAs by 0.8. To convert HCAs to CCAs, multiply HCAs by 0.69.]*

To start a 4-cylinder gasoline engine, you will need approximately 600-700 CCA; 6-cylinder gasoline engine, 700-800 CCA; 8-cylinder gasoline engine, 750-850 CCA; 3-cylinder diesel engine, 600-700 CCA; 4-cylinder diesel engine, 700-800 CCA; and 8-cylinder diesel engine, 800-1200 CCA.

In hot climates, buying batteries with double or triple the cranking amps that exceed your starting requirement can be a WASTE of money. However, in colder climates the higher CCA rating the better, due to increased power required to crank a sluggish engine and the inefficiency of a cold battery. As batteries age, they are also less capable of producing CCAs. According to the Battery Council International, diesel engines require 220% to 300% more current than their gasoline counterparts; winter starting requires 140% to 170% more current than the summer.



[Source: Exide]

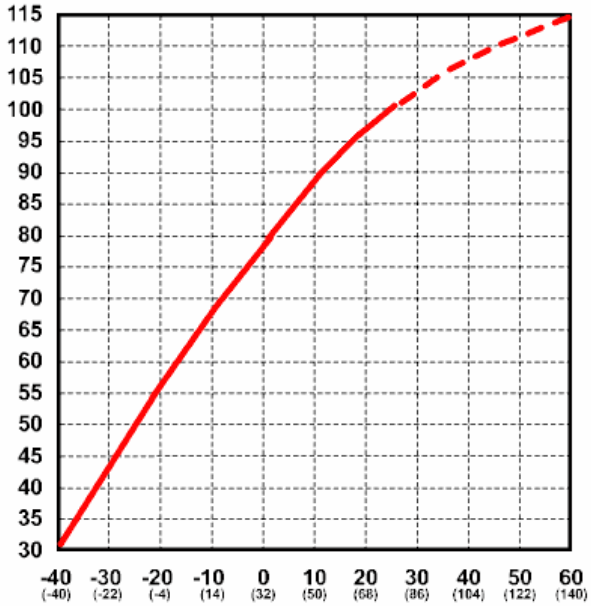
If more CCA capacity is required, two (or more) identical 12-volt car batteries can be connected in parallel. Please refer to Section 7.2 below for more information on connecting batteries in parallel. Within a BCI group size, the

battery with more CCA will have more plates because a larger surface area is required to produce the higher current.

7.2. Reserve Capacity (RC)

The second most important consideration is the Reserve Capacity rating because of the effects of increased parasitic (key off) loads and of emergencies. *RC is the number of minutes a fully charged battery at 80 o F (26.7 o C) can be discharged at 25 amps until the voltage falls below 10.5 volts. Deep cycle batteries are usually rated in Ampere-Hours. To convert Reserve Capacity to approximate Ampere-Hours, multiple RC by 0.4.* For example, a battery with a 120-minute RC will have approximately 48-Ampere-Hours of capacity at the 25-amp discharge rate. More RC is better in every case! In a hot climate, for example, if your car has a 360 OEM cranking amp requirement, then a 400 CCA rated battery with 120 minutes' RC and more electrolyte for cooling would be more desirable than one with 1000 CCA with 90 minutes of RC.

The following graph shows the effects of temperature vs. percentage of capacity:



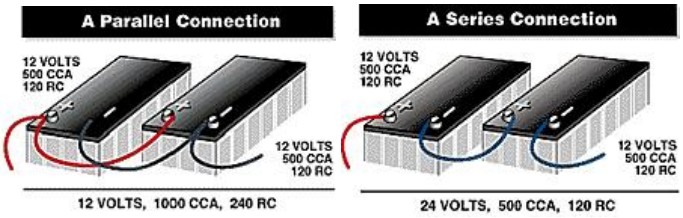
CAPACITY vs. TEMPERATURE
[Source: Concorde]

Adding more Reserve Capacity can be done in two ways. The best way is to add a deep cycle battery and a diode isolator to your existing car battery. This is a standard setup in most Recreational Vehicles (RVs). The advantage of this multi-battery setup is that the high-powered accessories can be powered from a deep cycle battery (or batteries) and the car battery is available to start the engine. The second advantage of using a deep cycle battery to power the high-powered accessories is that it can be discharged and recharged hundreds of times without damaging the battery. A car battery is not designed for deep discharges and will have a very short life if it is abused by deep discharges. A third advantage is that both batteries will be recharged automatically when the charging system has power available. An excellent and easy to understand free booklet, Introduction to Batteries and Charging Systems, written by Ralph Scheidler and about multi-battery applications, can be obtained from http://www.surepower.com/ebrochures.html or by calling (800) 845-6269 or (503) 692-5360.

The second way of increasing Reserve Capacity is by replacing the existing car battery with a large, 12-volt deep cycle battery or two identical large six-volt deep cycle batteries connected in series (connect the positive terminal of Battery One to the negative terminal of Battery Two). The deep cycle batteries must have enough current capacity to start the engine in the worst-case temperature.

If more ampere-hours (or CCA) are required, two (or more) new and identical 12-volt batteries can be connected in parallel. If you connect two 12-volt batteries in parallel, and they are identical in type, age and capacity, you can potentially double you original capacity. If you connect two that are not the same type, you will either overcharge the smaller of the two, or you will undercharge the larger of the two.

The recommended parallel and series connections are as follows:

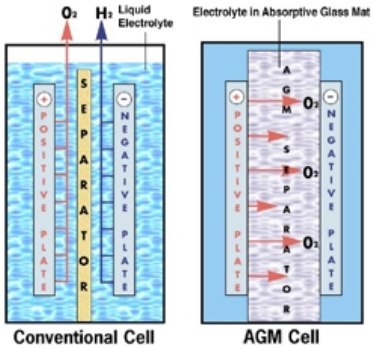


[Source: Interstate Batteries]

Connected this way the batteries will discharge and recharge equally. When connecting in series or parallel and to prevent recharging problems, do NOT mix old and new batteries or ones with different types. Cable lengths should be kept short and the cable should be sized large enough to prevent significant voltage drop [.2 volts (200 millivolts) or less] between batteries.

7.3. Type

The three most common types of CAR batteries are wet low maintenance (non-sealed), wet maintenance free (non-sealed or sealed), and gas-recombinant absorbed glass mat (AGM). *The low maintenance batteries have a lead-antimony/calcium (dual alloy or hybrid) plate formulation. Maintenance free batteries have a lead-calcium/calcium formulation.* Some of the battery manufacturers, such as Johnson Controls, build "North" and"South" battery versions to make up for the differences in climates. The advantages of maintenance free batteries are less preventive maintenance, up to 250% less water loss, faster recharging, greater overcharge resistance, reduced terminal corrosion, up to 40% more life cycles, up to 200% less self discharge, and less danger to consumers because there is less to service. However, they are more prone to deep discharge (dead battery) failures *due to increased shedding of active plate material and development of a barrier layer between the active plate material and the grid metal.* If sealed, a shorter life in hot climates is often experienced because water cannot be replaced. Maintenance free batteries are generally more expensive than low maintenance batteries. In hot climates, buying non-sealed "South"-type low maintenance, maintenance free or absorbed glass mat (AGM) battery is recommended.



[Source: Hawker]

If you replace a sealed maintenance free battery in a GM car with a non-sealed lead-antimony or lead-antimony/calcium low maintenance battery, you will need to check the electrolyte levels more often. *This is because GM sets their voltage regulators at higher charging voltage, 14.8 volts, to recharge the sealed maintenance free lead-calcium/calcium batteries, like the original AC Delco batteries.*

Sears has introduced a DieHard Security for approximately $170. When the ignition key is switched off, the battery will not allow the engine to be started but will provide power for the parasitic or "key off" load. Consumer Reports has tested it and indicates in the October, 2000 issue, that a car thief can defeat the security feature in less than one minute.

In the future, you can expect more expensive AGM or recombinant gas technology (GRT) batteries in the $100 to $150 price ranges. Examples of AGM batteries are Optima, Interstate's Extreme Performance, Concorde's Lifeline, Delphi's Freedom Extra, Exide's Select Orbital, AC Delco's Platinum, and Champion's Vortex. The use of this technology is because car manufacturers want to extend their "bumper-to-bumper" warranty periods, to relocate the battery from under the hood to avoid temperature extremes, to provide more weight in the rear, or to save under-hood space. The advantages of AGM batteries are they are maintenance free without the disadvantages of wet lead acid maintenance free batteries; they will last two to three times longer, if not overcharged. An AGM battery can replace a wet low maintenance battery, but a wet low maintenance battery cannot replace an AGM battery without adjusting the charging voltages. *Expect to see 36-volt AGM car batteries with 14/42-volt dual or 42-volt electrical systems introduced by some of the car manufacturers in 2002*.

For off road applications in trucks, recreational vehicles (RVs), 4x4's, vans or sport utility vehicles (SUV's), some manufacturers distribute "high vibration" or RV battery versions designed to reduce the effects of moderate vibration. For excessive vibration applications such as is experienced in off-road operation, it is best to use an AGM battery because there is no shedding of active plate material since the plates are immobilized. Some manufacturers construct special batteries that have a higher tolerance to heat by changing plate formulations or providing for more electrolyte.

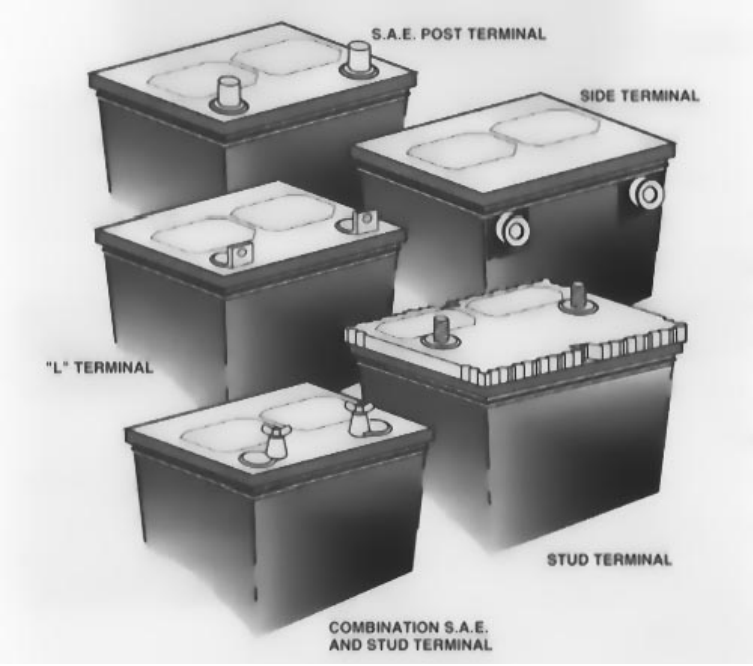
Car batteries are specially designed for high initial amps applications and shallow discharges. Cars usually start in five to 15 seconds; to start an enginetypically consumes 5%-10% of the battery's capacity. Car batteries should NOT be discharged below 90% state-of-charge. By contrast, marine batteries are designed for prolonged discharges at lower amperage that typically consumes between 20% and 50% of the battery's capacity and deep cycle the batteries in a range between 20% and 80%. A "dual" or starting marine battery is a compromise between a car and deep cycle battery that is specially designed for marine applications. A deep cycle or "dual marine" battery will work as a starting battery if it can produce enough current to start the engine. For saltwater applications, AGM or gel cell batteries are highly recommended to prevent the formation of high levels of chorine gas.

7.4. Size and Terminals

Manufacturers build their batteries to an internationally adopted Battery Council International (BCI) group number (24, 26, 70, 75, etc.). These specifications, which are based on the physical case size, terminal placement, type and polarity is used extensively in North America. *In Europe, the EN, IKC, Italian CEI, and German DIN standards are used and in Asia, the Japanese JIS standard is used.* The OEM battery group number is a good starting place to determine the replacement group. Within a group, the CCA and RC ratings, warranty and battery type will vary within models of the same brand or from brand to brand. Batteries are generally sold by model, so the group numbers will vary for the same price. This means that for the SAME price, you can potentially buy a physically larger battery with more CCA or RC than the battery you are replacing. For example, a 34/78 group might replace a smaller 26/70 group and give you an additional 200 CCA or 30 minutes of RC. If you buy a physically larger battery, be sure that the replacement battery will fit, the cables will connect to the correct terminals, and that the terminals will NOT touch surfaces such as the hood when it is closed.

BCI and the battery manufacturers publish application guides that contain OEM cranking amperage requirements and group number replacement recommendations by make, model and year of car, battery size, and CCA and RC specifications. You can also find BCI size information online at http://www.exidebatteries.com/bci.cfm. Manufacturers might not build or the store might not carry all the BCI group numbers. To reduce inventory costs, dual terminal "universal" batteries that will replace several group sizes are becoming more popular and fit 75% or more of cars on the road today.

There are six types of battery terminals-SAE Post, GM Side, "L", Stud, combination SAE and Stud, and combination S.A.E Post and GM Side. For automotive applications, the SAE Post is the most popular, followed by GM Side, then the combination "dual" SAE Post and GM Side. "L" terminal is used on some European cars, motorcycles, lawn and garden equipment, snowmobiles, and other light duty vehicles. Stud terminals are used on heavy duty and deep cycle batteries. The positive SAE Post terminal in slightly larger (by 1/16") than the negative one. Terminal locations and polarity will vary.



[Source: BCI]

Battery manufacturers or distributors will often "private label" their batteries for large chain stores. An alphabetical list in order of the largest battery manufacturers/distributors in North America and some of their brand names, trademarks and private labels maybe found at http://www.uuhome.de/william.darden or contact Bill Darden at mailto:bjb_darden@yahoo.com. Ownership, branding, Web addresses and telephone numbers are subject to change. For example, on September 29, 2000, Exide purchased GNB and Johnson Controls purchased Gylling Optima. Exide is the largest battery manufacturer in the world, and Johnson Controls is the largest manufacturer in the Americas.

7.5. Freshness

Determining the "freshness" of a battery is sometimes difficult. NEVER buy a wet lead acid battery that is MORE than

THREE months old because it has started to sulfate unless it has periodically been recharged or it is "dry charged." The exceptions to this rule are AGM and Gel Cell batteries that can be stored up to 12 months before the state-of-charge drops below 80%. Please see Section 16 for more information on sulfation. Dealers will often place their older batteries in storage racks so they will sell first. The new batteries can often be found in the rear of the rack or in a storage room. The date of manufacture is stamped on the case or printed on a sticker.

Some of the manufacturers date coding techniques are as follows:

7.6.1. Delphi (AC Delco and some Sears DieHard)

Dates are stamped on the cover near one post. The first number is the year. The second character is the month A-M, skipping I. The last two characters indicate geographic areas. Example 0BN3=2000 February.

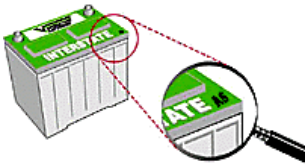
[Source: Interstate Batteries]

7.6.2. Douglas

Douglas uses the letters of their name to indicate the year of manufacture and the digits 1-12 for the month. D=1994 O=1995 U=1996 G=1997 L=1998 A=1999 S=2000 Example S02=2000 Feb.

7.6.3. East Penn, GNB (Champion), and Johnson Controls Inc. (Interstate and some Sears DieHard)

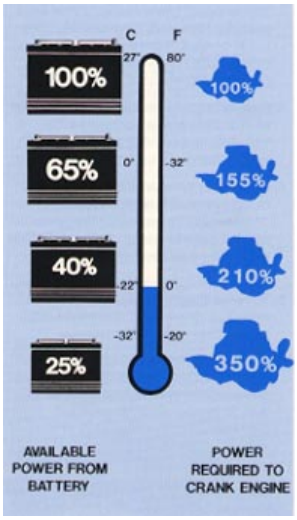
Usually on a sticker or hot-stamped on the side of the case. A=January, B=February, and the letter I is skipped. The number next to the letter is the year of SHIPMENT. Example B0=Feb 2000



[Source: Interstate Batteries]

7.6.4. Exide (some Sears non-Gold DieHards)

The fourth or fifth character is the month. The following numeric character is the year. A-M skipping I. Example RO8B0B=Feb. 2000.



[Source: Interstate Batteries]

7.6.5. Trojan

Stamp on post, 2 Months AFTER manufacture date.

If you cannot determine the date code, ask the dealer or contact the manufacturer. Like bread, fresher is definitely

better and does matter.

7.7. Warranty

As with tire warranties, battery warranties are NOT necessarily indicative of the quality or cost over the life of the battery. Most manufacturers will prorate warranties based on the LIST price of the bad battery, so if a battery failed half way or more through its warranty period, buying a NEW battery outright might cost you less than paying the difference under a prorated warranty. The exception to this is the FREE replacement warranty and represents the risk that the manufacturer is willing to assume. A longer free replacement warranty period is better.