



Battery Inspection and State of Charge

When a vehicle exhibits symptoms of a starting or charging system problem, the first test to perform should be a visual and voltage test of the battery. A battery with low voltage will affect all other test data collected and may lead to the unnecessary replacement of a good starter or alternator. Low battery voltage will also over-work the replacement starter or alternator resulting in premature failure.

Safety

Before testing a battery it is very important to follow some simple safety rules. Always wear eye protection and keep open flames away from the battery. If using a battery charger, always confirm that the charger is off before connecting or disconnecting the charger. Batteries produce hydrogen gas which is extremely flammable; do not smoke while servicing a battery. Batteries should only be charged in well ventilated areas. The electrolyte in the battery contains sulfuric acid, latex gloves are highly recommended.

Inspect the Battery

Visually inspect the battery for obvious problems. Some of the things to look for include low electrolyte level, corroded battery terminals, swollen or corroded battery cables, loose battery terminals, loose battery hold down, and damaged battery case. Replace or repair as necessary.

Non-Sealed Battery Voltage Test

There are two ways to test the batteries state of charge. The first is for non-sealed batteries. For this test you will need a high quality hydrometer. A hydrometer measures the specific gravity (also known as relative density) of fluids. All hydrometers are calibrated at 80° Fahrenheit. For temperatures other than 80° Fahrenheit, use the Temperature Compensation Chart (figure 1) to adjust the specific gravity readings. The electrolyte in a fully charged battery contains 65% water and 35% sulfuric acid. In this combination the electrolyte

will have a specific gravity of 1.260 at 80° Fahrenheit. Measure and record a reading from each battery cell. If the readings are below 1.235 (75% charge) the battery will require a charge before being put into service. If the difference between the highest and lowest reading is more then .050 the battery should be replaced.

Temperature Compensation Table

Electrolyte Temperature Fahrenheit	Add or Subtract to Hydrometer Reading	Add or Subtract to DVOM Reading
120°	+.016	+.096
110°	+.012	+.072
100°	+.008	+.048
90°	+.004	+.024
80°	0	0
70°	-.004	-.024
60°	-.008	-.048
50°	-.012	-.072
40°	-.016	-.096
30°	-.020	-.120
20°	-.024	-.144
10°	-.028	-.168
0°	-.032	-.192

Figure 1

Sealed Battery Voltage Test

The second state of charge test is for sealed batteries. Many of these batteries are equipped with an “EYE” that depending on the color observed will indicate the battery’s state of charge. The problem with this test is that it only indicates the state of charge for one cell. The state of charge of sealed batteries is best determined by using a DVOM (Digital Volt Ohm Meter). If the battery has been recently charged the surface charge must first be removed. This is best accomplished by turning the vehicles headlight on for a few minutes. After the

surface charge has been removed connect a DVOM across the battery and measure the DC voltage. This is the static voltage of the battery. A fully charged battery will have a static voltage reading of 12.6 volts at 80° Fahrenheit. For temperatures other than 80° Fahrenheit use the Temperature Compensation Chart (figure 1) to adjust the static charge readings. A battery with a reading below 12.4 (75 % charged) will require a charge before being put into service.

