

# Automotive Technical Institute LLC

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Test Don't Guess!

## Battery Testing with a Voltmeter and a Battery Charger

NOTE: If the battery is in the vehicle, perform all these tests, if the battery is out of the vehicle, perform the vehicle tests after you put the battery back in the vehicle.

- 1) What state is the battery in? This determines where we start our testing.
  - a. Static – battery has been sitting not discharging or charging. NOTE - If the vehicle has not been driven in over 5 days the battery needs to be charged.
  - b. Loaded/Discharging – battery is having current taken from it. How much current? The battery must be charged before testing
  - c. Charging – the battery is being charged either by the vehicle while the engine is running or by a battery charger. The battery must be taken off the charger or the vehicle turned off before testing. The true state of charge of the battery will not be known for several minutes after coming off a charger.  
NOTE: all batteries have a “surface charge” when they come off being charged. The terminal voltage will show higher than the actual battery can maintain. If the battery voltage is above 12.8 volts you can remove the surface charge by turning on the headlights for 10 seconds.
  - d. Recovery from charging or being discharged refer above.
    - i. Charge – the battery voltage will be high and fall as time passes to its real state
    - ii. Discharge – the battery voltage will be low, it may recover some but will not raise to fully charged without being charged. The battery needs to be charged before it can be tested.

- 2) Test static battery terminal voltage. Static means not recovering from being charged or discharged.

A good battery fully charged will read 12.6 – 12.8 volts DC

50% charged 12.4-12.5 volts DC

20% charged 12.1-12.2 volts DC

12.0 volts almost no charge

Battery voltage

State of charge / condition

\_\_\_\_\_  
\_\_\_\_\_

If the battery voltage is less than 12.6 volts the battery will need to be charged in order to test it.

3) Start the engine and run at idle

4) Test the charging system at the battery terminals with your voltmeter:

Charging DC volts (13.5 – 15v DC)

\_\_\_\_\_

Charging AC volts (maximum .035v AC)

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5) Turn on the headlights and retest the charging system.

Charging DC volts (13.5 – 15v DC)

\_\_\_\_\_

Charging AC volts (maximum .035v AC)

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a. If the readings are within the normal ranges specified above, the alternator is working properly.

b. If the DC volts are not in the normal ranges specified above, there is a problem with the alternator/charging system. It could be a bad alternator or a wiring problem or a computer problem.

c. High AC volts indicates a rectifier/diode problem in the alternator. The alternator may appear to be working but will destroy the battery with AC voltage.

6) Test the drain on the battery with engine and everything in the vehicle turned off. To do this disconnect the negative battery cable from the negative battery terminal then connect a meter set for 2 amps scale between the negative battery cable and the negative battery terminal.

a. If the vehicle does not have a computer that displays trouble codes (prior to 1980), there should be no draw on the battery when the engine and everything in the vehicle is turned off

b. If the vehicle has a computer that displays trouble codes (starting about 1980) there will be a spark when you make the connection. The reading will start high then fall (Maybe 1.2 amps}. It may take 30 seconds to a minute for everything to charge up and shut down. The maximum draw on the battery with everything turned off should be .040 amps. This draw is caused by the keep alive memory system for the computer in the vehicle.

What is the amps reading?

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- If the current draw reading is equal to or less than the amount specified above the system is working normally. You should not have any problems from a current draw.

- If the current draw is higher than the specified amount above, there is excessive current draw and there is a problem in the electrical system. It will drain the battery dead very fast. Fix it.

- 7) Charge the battery with a battery charger until battery charger shows a charge rate of 5 amps or less. When the charge rate of the battery charger comes down to about 5 amps, turn the battery charger off and disconnect it from the battery.
- A charge rate of 5 amps indicates the battery should be fully charged.
  - **Do not allow the charging voltage to go over 15 volts.** A minute or 2 above 15 volts will not destroy a battery but more time than that can burn up the battery. Batteries die and are damaged by charging.
  - **NOTE cold batteries with a temperature below 30° F charge differently. They need to be charged at a low rate until they warmup to 60° F inside. Use the charging voltage to determine your rate of charge. Do not exceed 15v while charging.**
- 8) Watch the battery voltage as the battery recovers/stabilizes after a charge. The battery voltage will fall toward it's normal voltage, it's static voltage. The static voltage indicated the state of charge and condition of the battery.
- 9) Let the battery sit for 15 minutes and test the voltage. The battery voltage should be between 12.6 and 12.8 volts. **If the voltage is above 12.8 volts you can remove the surface charge by turning on the headlights for 10 seconds. Then retest your battery voltage.** What is the voltage? \_\_\_\_\_
- A reading between 12.6 and 12.8v DC indicated the battery is fully charged.
  - **A reading of less than 12.6 volts means the battery is weak and possibly bad.**
- 10) Retest the battery voltage after 3 hours, voltage should be within .2 volts of the reading in step 9. What is the voltage? \_\_\_\_\_
- a. If the battery voltage is 12.6-12.8 volts the battery is good and fully charged
  - b. If the battery voltage is more than .2 of a volt lower than step 8, retest in 2 more hours.**
- 11) Retest the battery voltage What is the voltage? \_\_\_\_\_
- a. If the battery voltage is the same as in step 10 the battery is charged and in ok condition. There is wear in the battery, it does not have the same power as when it was new. It may very well still work in your vehicle.
  - b. If the battery voltage is less now than it was in step 10 the battery is bad, it is not holding a charge. This battery may work well until you leave your radio on while you wait for someone with the engine off or the outside temperature drops to 0° F or colder, then it will most likely fail and leave you stranded**