

Basic Battery System Testing (3 Steps)

STEP 1 of 3

The purpose of **STEP 1** is to check the state-of-charge of the battery. The hydrometer test is the preferred method and results can be found in the first chart below.

If the battery is sealed then use a digital voltmeter to test across the battery terminals. Results can be found using the bottom chart.

If either test shows the battery less than 100% charged, recharge using a battery charger and proceed to **STEP 2**.



Checking the specific gravity (the ratio of acid to water in the battery)

This cannot be performed on sealed-top battery.

Tools required: Hydrometer

If the specific gravity of the individual cells varies more than 25 points, replace the battery.

Specific Gravity	State-of-Charge
1.265	100%
1.225	75%
1.190	50%
1.155	25%
1.120	Discharged

Checking the voltage of the battery

Tools required: Digital Voltmeter, set on DC Volts

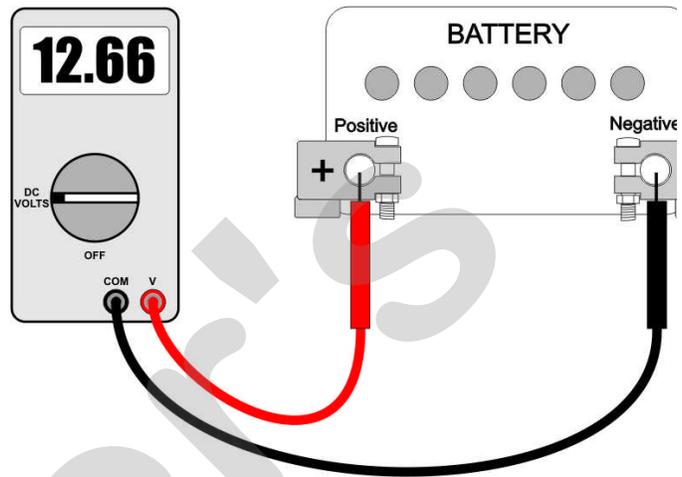
If the voltage is less than 12.55 volts make sure nothing has been left on that can discharge the battery. If the voltage is less than 10.5 volts, replace the battery.

Battery Voltage	State-of-Charge
12.66	100%
12.45	75%
12.24	50%
12.06	25%
11.89	0%
10.5 or 8.4	Replace the battery, one or two cells are shorted

Basic Battery System Testing (3 Steps) - continued

STEP 2 of 3

STEP 2 performs a basic load-test of the battery, using the vehicle's starter motor. This test is done with the engine cranking. Use care to keep the voltmeter test leads from contacting moving or hot engine parts.



Tool required: Digital Voltmeter, set on DC Volts

Test Lead position: as shown in diagram above

While cranking, read the voltmeter. If the voltage reading is below the minimum listed in the following chart, replace the battery.

Be aware that other possible causes of low readings in this test are a failing starter motor or an engine with mechanical problems.

Minimum Battery Load-test Voltage	Battery Temp Degrees F
9.90	100
9.80	90
9.70	80
9.60	70
9.50	60
9.40	50
9.30	40
9.10	30
8.90	20
8.70	10
8.50	0

Basic Battery System Testing (3 Steps) - continued

Step 3 of 3

In **STEP 3** you will use voltage-drop tests to check if high-resistance in cables or in a connection is preventing the full flow of current.

Be sure to read the section *Voltage-Drop Testing* (See Index), to ensure you have an understanding of how to perform the tests and how to understand the results.



Tools required:

- Digital Voltmeter set on DC Volts
- Wire Brush to clean terminals

Refer to diagram on opposite page for test lead locations

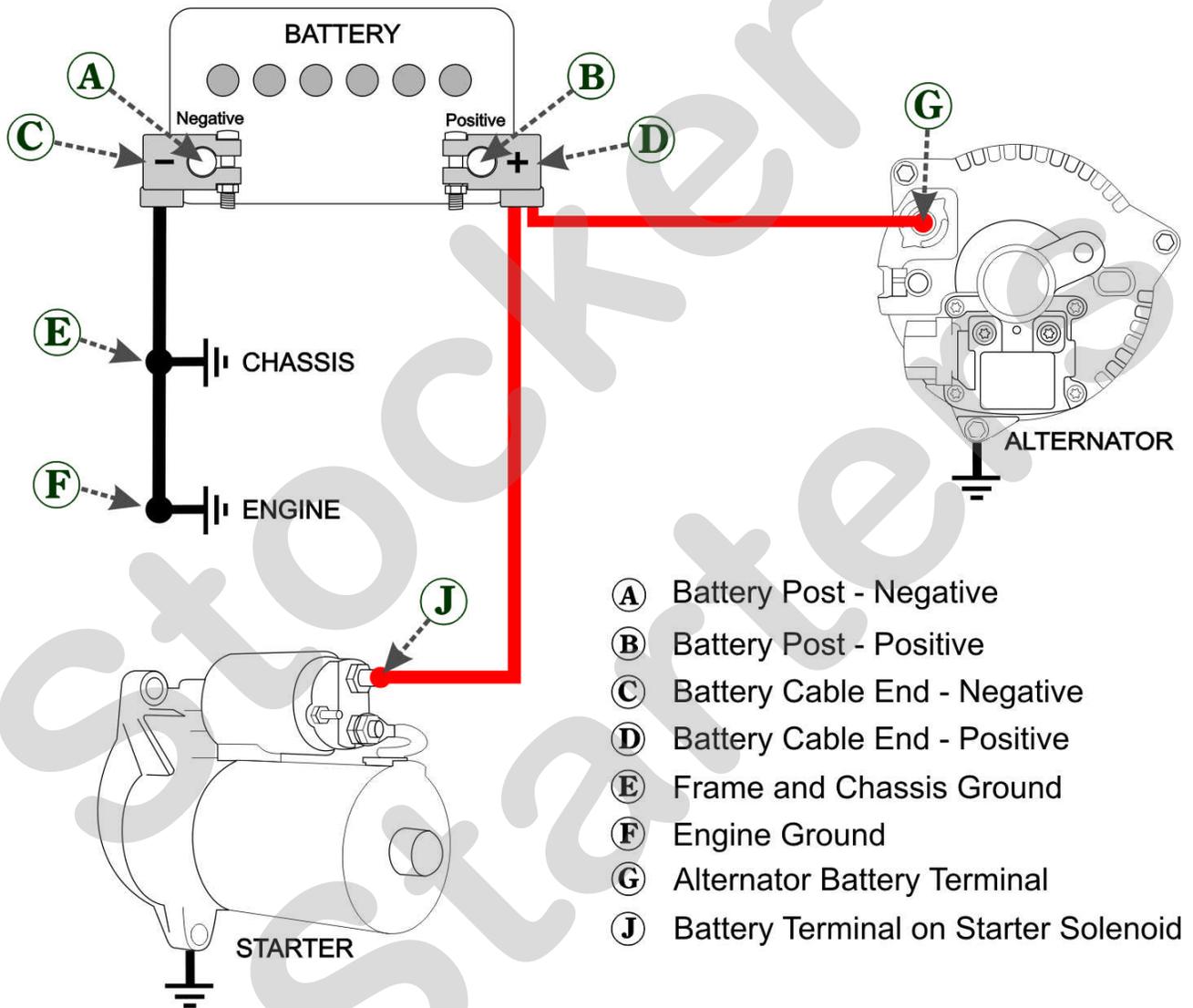
How to Load Circuit	Test-lead Positions	Maximum Reading	Reading Meaning
Use starter motor to crank engine	A and C	0.1v	If higher, clean the cable end or replace the cable and retest.
Use starter motor to crank engine	B and D	0.1v	If higher, clean the cable end or replace the cable and retest.
Use starter motor to crank engine	A and E	0.1v	If higher, clean the cable end or replace the cable and retest.
Use starter motor to crank engine	A and F	0.1v	If higher, clean the cable end or replace the cable and retest.
Use starter motor to crank engine	B and J	0.2v	If higher, clean the cable end or replace the cable and retest.
<ul style="list-style-type: none"> • Engine running • Headlights on • Heater fan on high • Engine RPM at 2000 	B and G	0.3v	If higher, clean the cable ends or replace the cable and retest.

Take care when using jumper wires. Avoid causing accidental arcs and sparks because they can damage onboard electronics.

Basic Battery System Testing (3 Steps) - continued

STEP 3 - BATTERY SYSTEM TESTS

Voltage-drop Test Points



Testing Safety and Warnings

- Never disconnect the battery while the engine is running.
- Alternators are designed to maintain batteries, not recharge them from dead.
- Keep hands and test-leads away from belts, fans and other moving parts.
- Be sure belts are not worn and are adjusted properly.
- Start all tests with a fully charged battery.
- Clean and inspect all wires and connections.
- Be sure that all grounding surfaces are cleaned to bare metal.
- Verify that alternator amperage is adequate for the vehicle loads.
- Be sure all mounting fasteners are tight.
- Do not over tighten alternator or battery cable connections.
- Ensure automatic tensioners operate properly. The tension spring should not bind, and the pulley bearing should operate smoothly without excessive free play.
- Ensure the transmission is in park or neutral during all tests, and the parking brake is set.
- Disconnect the battery before removing the starter or alternator.
- When removing the alternator, always disconnect the voltage-regulator plug first and reconnect it last.
- Always disconnect battery negative before battery positive and install in reverse order.
- Never use a battery charger as a power supply to test a starter motor.
- When replacing a starter motor, always inspect the ring gear for worn or damaged teeth.
- Always clean the starter mounting-surface to ensure the starter mounts properly.
- Always ensure all starter or alternator mounting bolts are properly torqued.
- Clean and inspect all connections to the starter, solenoid, alternator and battery when removing and replacing cables.
- Use dielectric gel in all plug connections to avoid future corrosion and water penetration.
- Be sure to replace all original brackets, air ducts, etc to ensure proper support and cooling.
- Some applications require the electronic control module codes to be cleared and reset before a replacement alternator will operate properly. If the proper scan-tool is not available, this will require a trip to either the dealer or a well-equipped electrical shop.
- Always test and charge batteries in a well ventilated area. The gasses emitted by batteries are highly explosive.
- Always wear eye protection when working with a battery, and avoid getting the electrolyte on skin and clothing. The electrolyte is sulfuric acid and is highly corrosive.
- When working with active circuits, be careful to avoid accidentally grounding circuits or contacting wires and terminals with rings, watches or other jewelry. For example, contact from the battery terminal to a wrench and a ring on the hand could cause a short if the ring came into contact with the frame or fender.

Special Note

- The electronic control module may need to be reset using a scan-tool if the “Check Engine” light remains on after any repair.
- Be sure to supply the Vehicle Identification Number (VIN) and Accessory Number before replacing a starter or alternator.