

Modern Automotive Technology Chapter 32

Starting System Testing & Repair



North Montco
Technical Career Center

Learning Objectives

- Diagnose common starting system troubles
- Make orderly starting system tests
- R&R Starter
- Explain typical procedures for a starting motor rebuild
- Describe safety practices to follow when testing or repairing starting systems

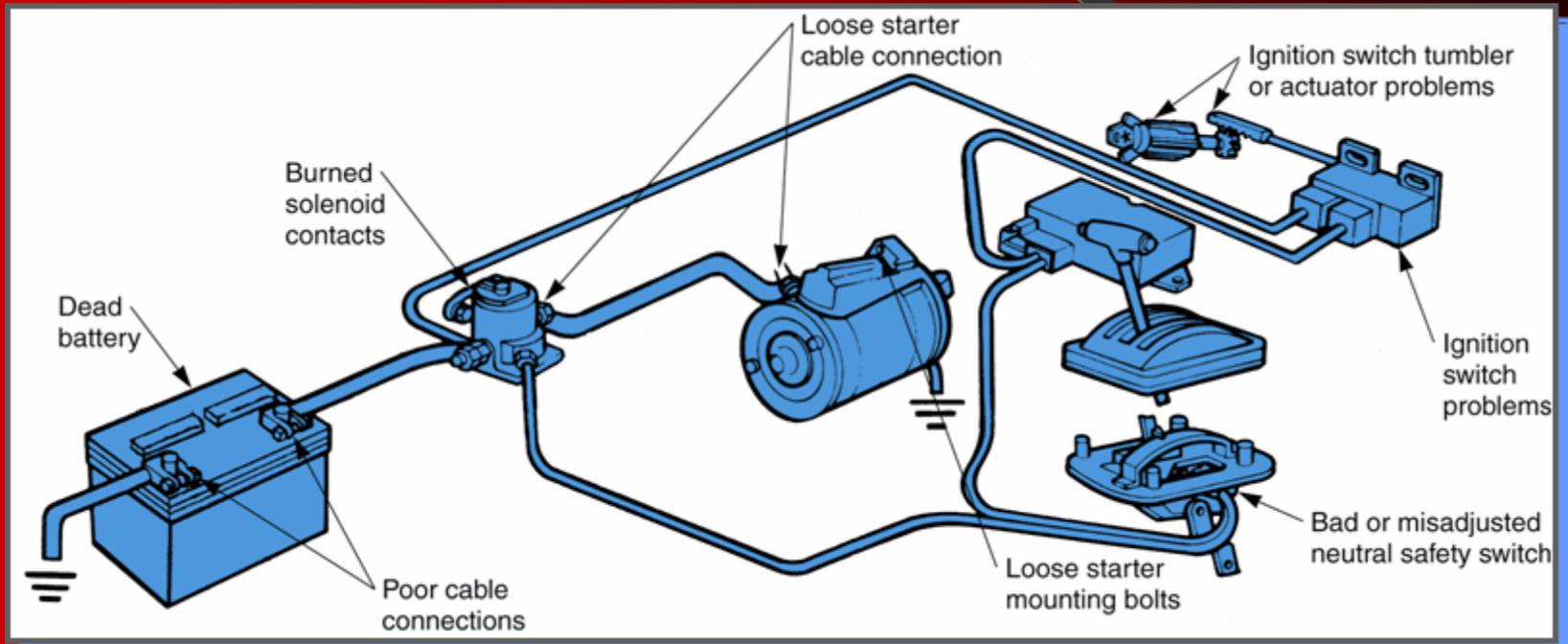


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1. A Single Click Sound (noise) is usually caused by the solenoid closing or the pinion gear contacting the flywheel gear.
2. A Discharged or Poorly Connected Battery can operate the lights but may not have enough power to operate the starting motor.

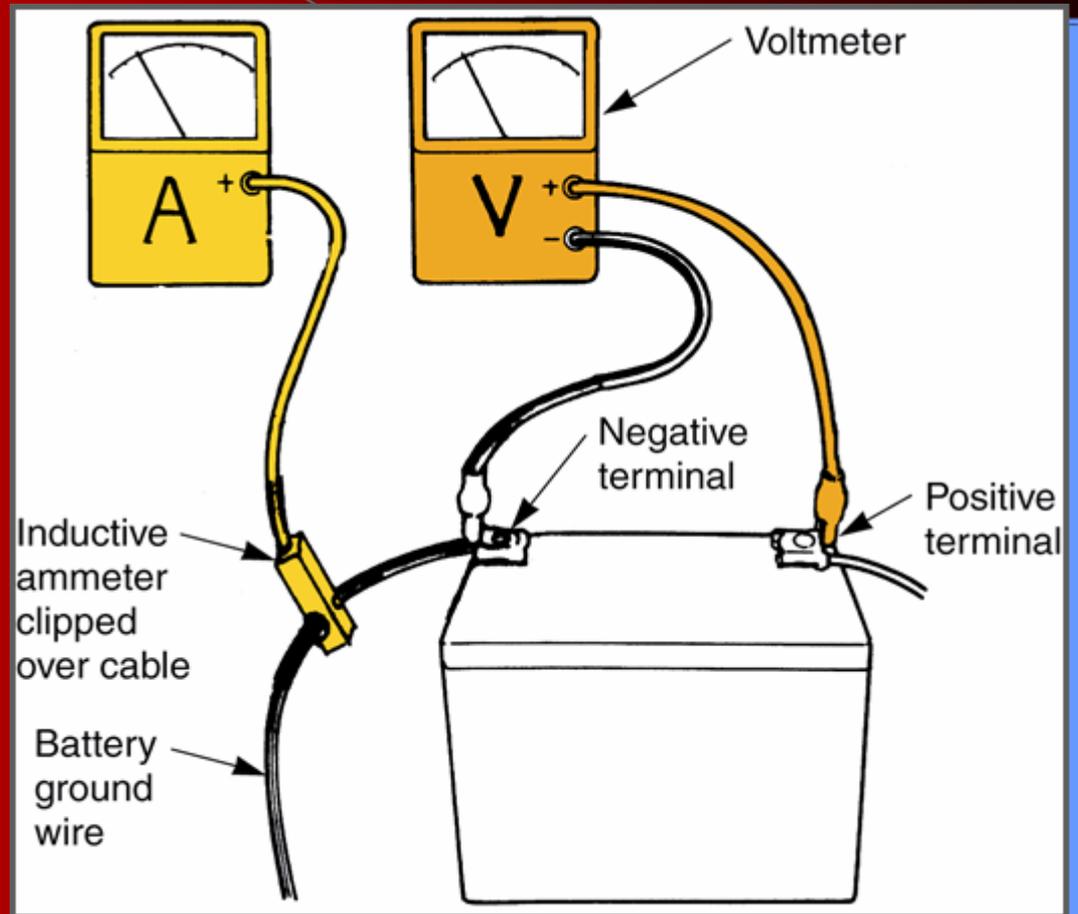


Basic Starting System



Voltage Test

A voltmeter is needed to verify battery condition

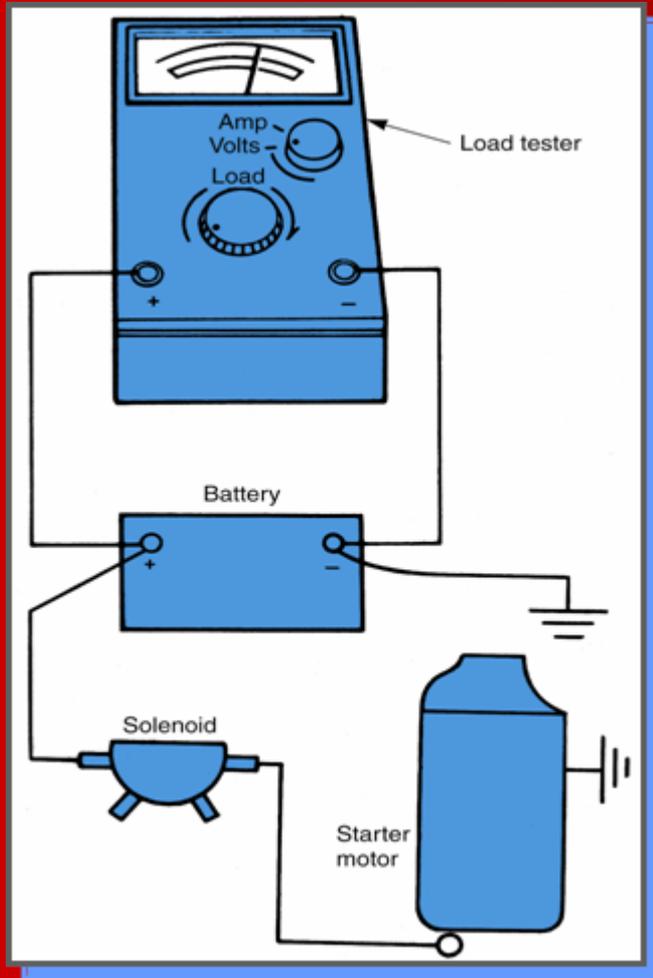


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3. A No-Crank condition happens when the engine crankshaft does not rotate when the ignition key is turned to the start position.
4. A Buzzing or Clicking Noise is caused by low current (amps) flow making the solenoid plunger rapidly kick in and out.



Load Test



Load Test to
determine current
draw (load)

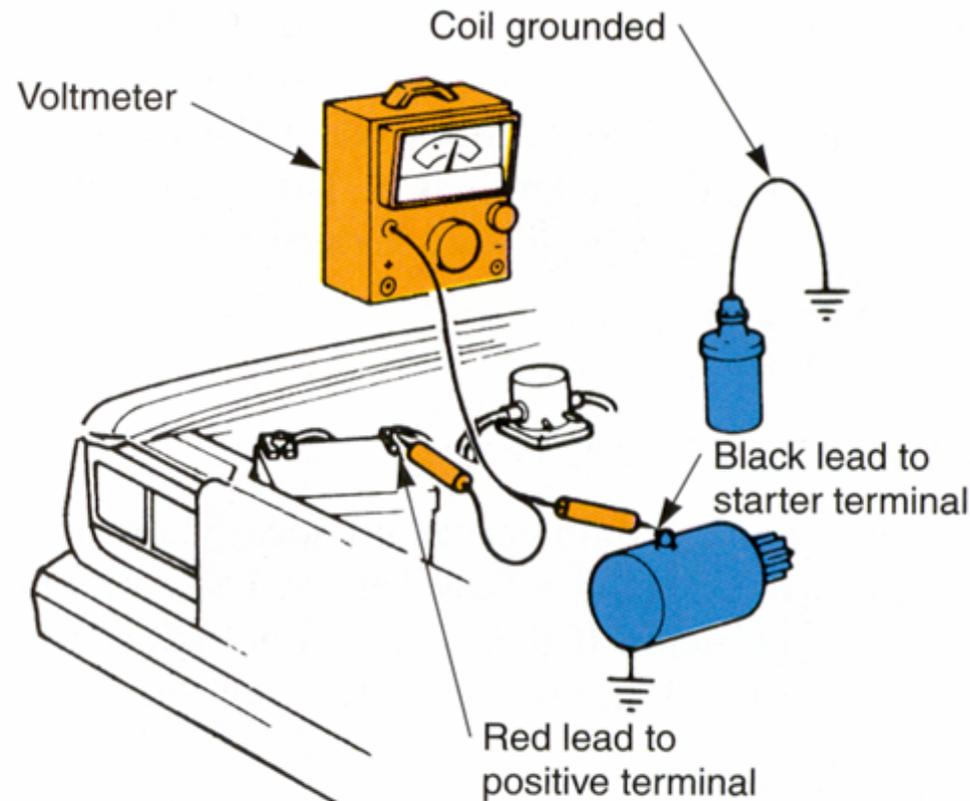


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5. A Slow-Crank condition occurs when the engine crankshaft rotates at speeds that are lower than normal.
6. A Voltage Drop Test quickly locates a part (or circuit) with higher-than-normal resistance.



Insulated Circuit Resistance Test



Insulated circuit resistance test

Insulated
(Positive/B+)
Circuit
Resistance Test



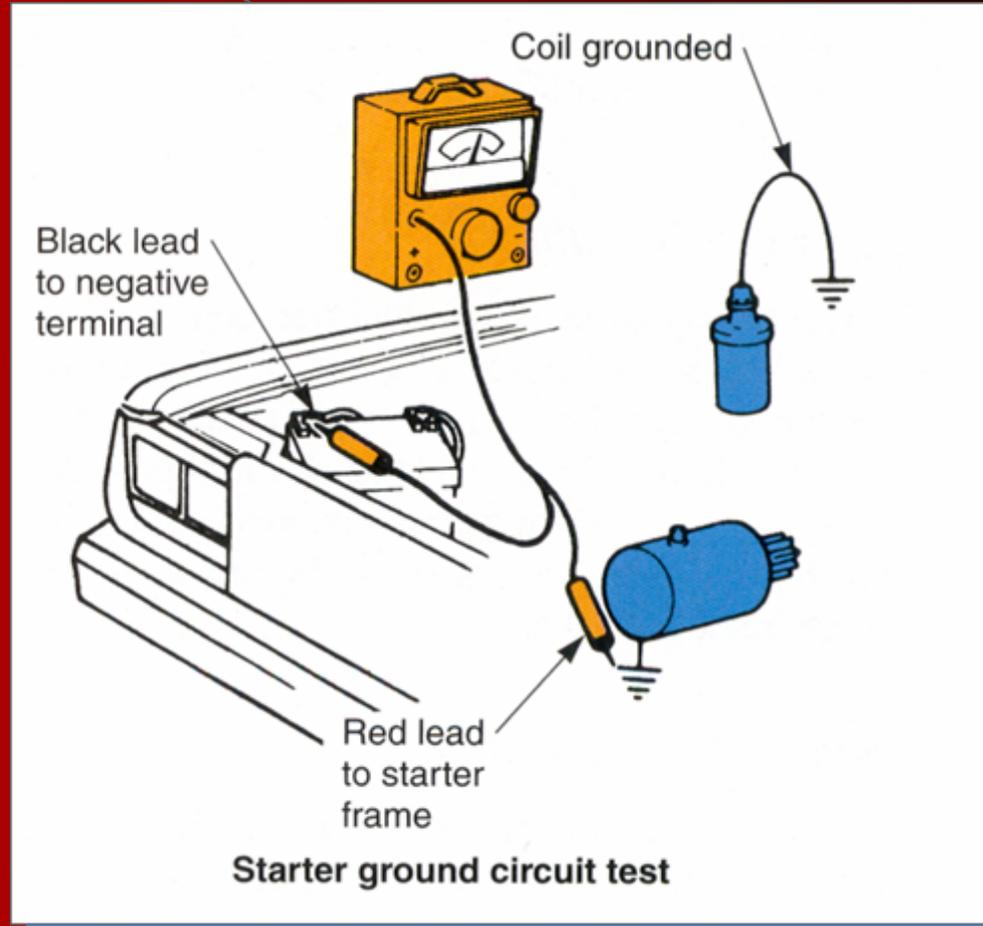
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7. A Bent Armature Shaft allows the armature to drag or rub on the field pole shoes.
8. A Starter Ground Circuit Test is used to check the circuit between the starting motor ground and the negative battery terminal.



Voltage Drop Test

Voltage Drop (Ground Circuit) Resistance Test

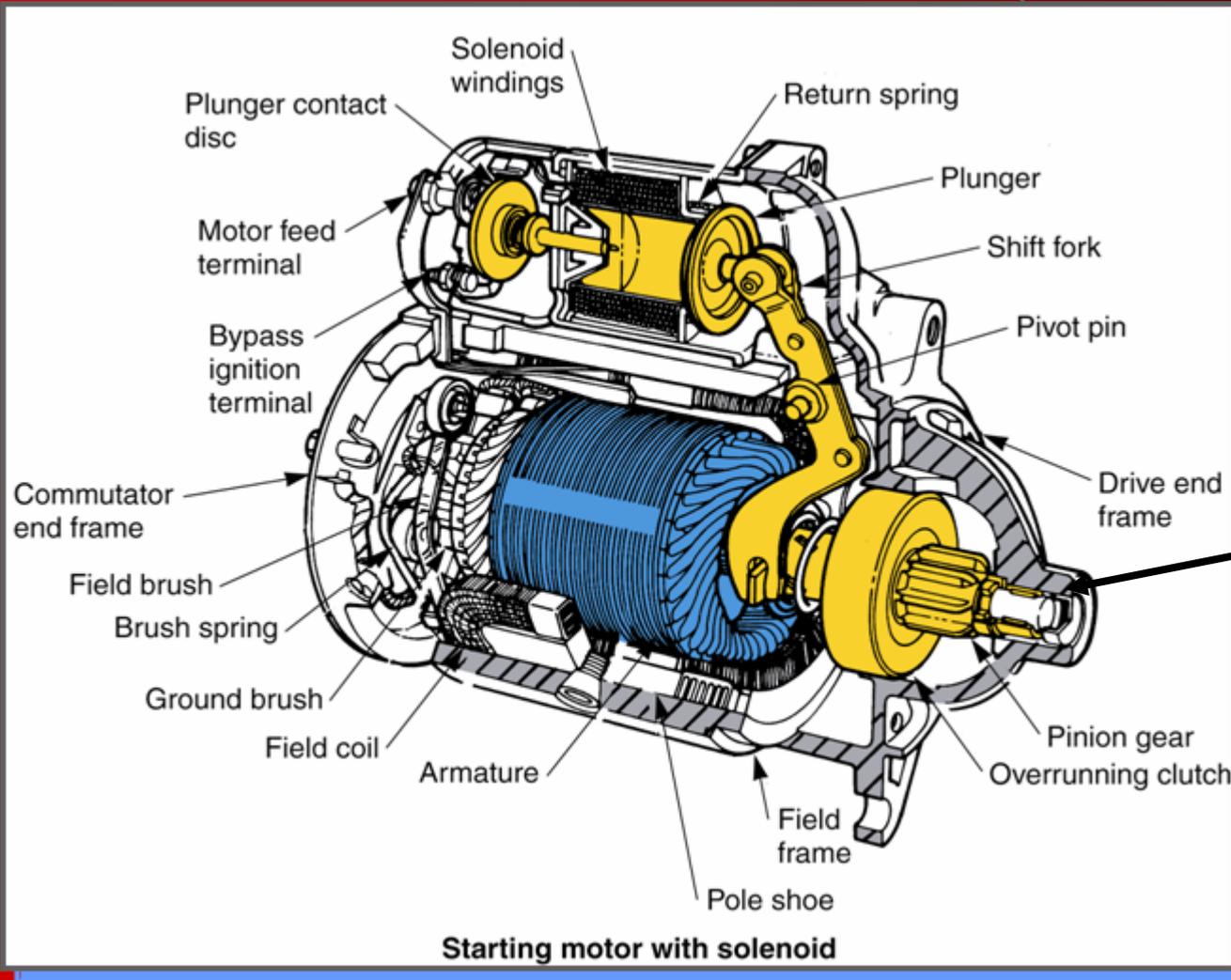


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9. The Pinion Gear Clearance is the distance between pinion and drive end frame with pinion engaged.
10. Starter Shims are used to adjust the space between the pinion gear and the flywheel ring gear.



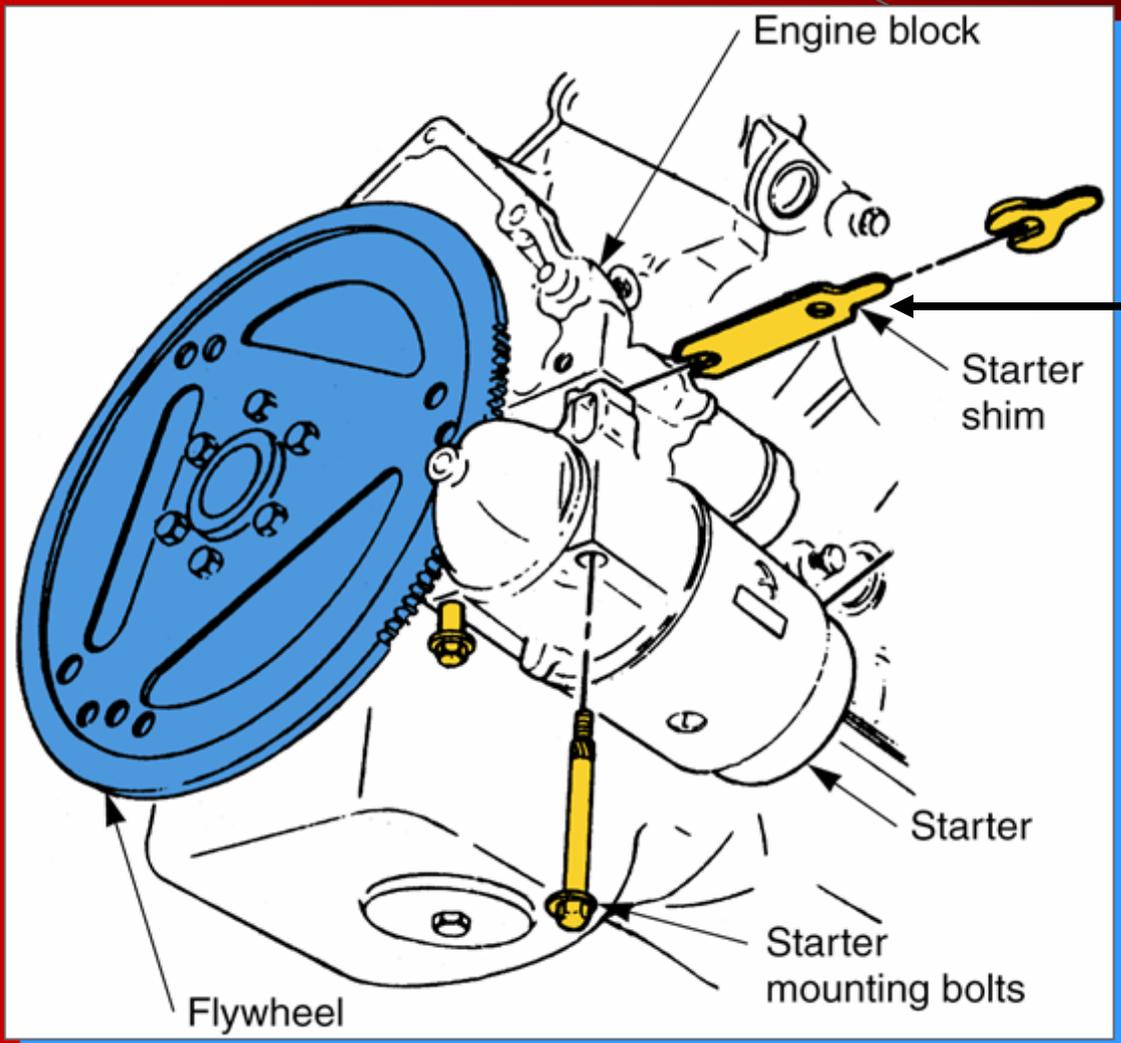
Starter Motor



Pinion Gear Clearance



Starter Shims



Note starter shim location



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11. The Starter Current Draw test measures the number of amps used by starting system.

12. A Metallic Grinding Noise may be caused by broken flywheel teeth or pinion gear teeth wear.



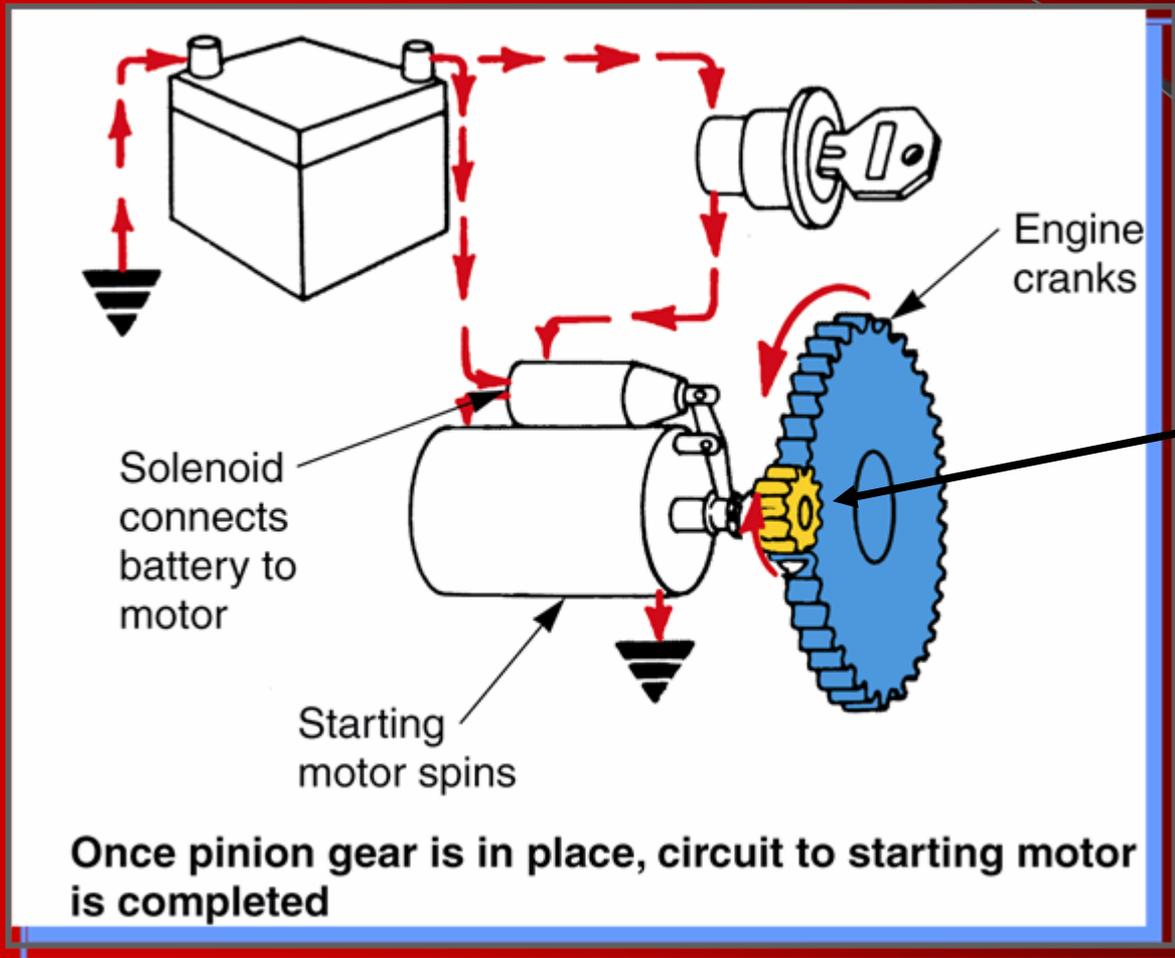
Starter Motor Current Draw

Starter Motor Current Draw Test Values

ENGINE DISPLACEMENT	12-VOLT SYSTEM MAX. CURRENT	
Most 4–6 Cylinders	125–175 Amps Max.	
Under 300 C.I.D.	150–200 Amps Max.	
Over 300 C.I.D.	175–250 Amps Max.	
CRANKING CIRCUIT TROUBLESHOOTING CHART		
Cranking Voltage	Cranking Amps	Possible Problem
Voltage OK	Current OK	System OK
Voltage OK	Current Low Engine Cranks Slowly	Starter Circuit Connections Faulty
Voltage Low	Current Low Engine Cranks Slowly	Battery Low
Voltage Low	Current High	Starter Motor Faulty



Starting System Testing



Grinding noise may be caused by broken flywheel teeth or pinion gear teeth wear



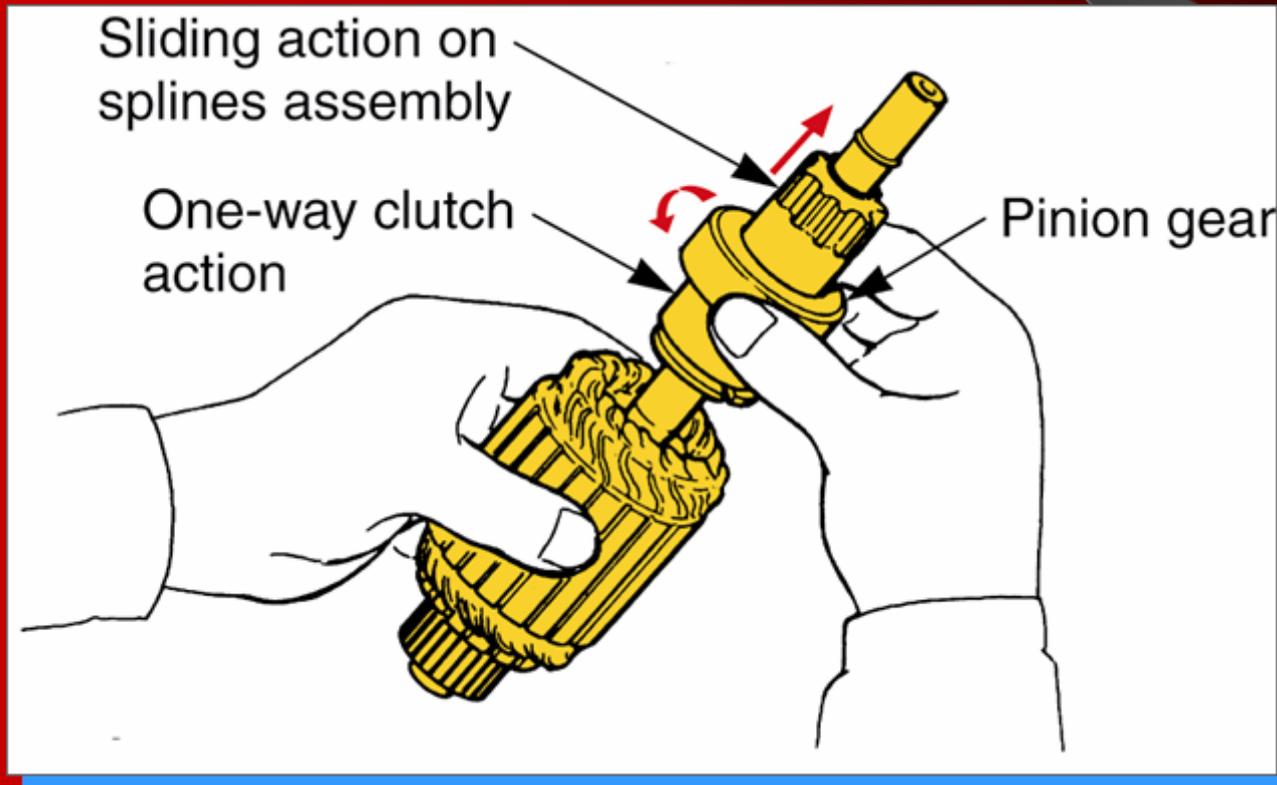
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13. A Battery Cable Connection test is performed by connecting a voltmeter to the battery post and to the cable and measuring the voltage drop across the connections while cranking the engine.
14. To test for a Bad Starter Relay, check the voltage going into and coming out of the terminals.

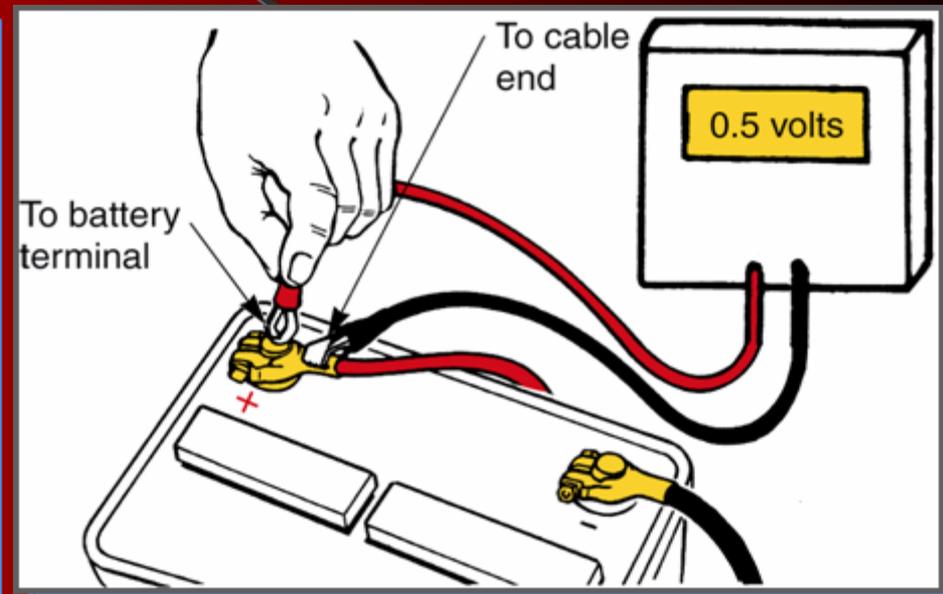
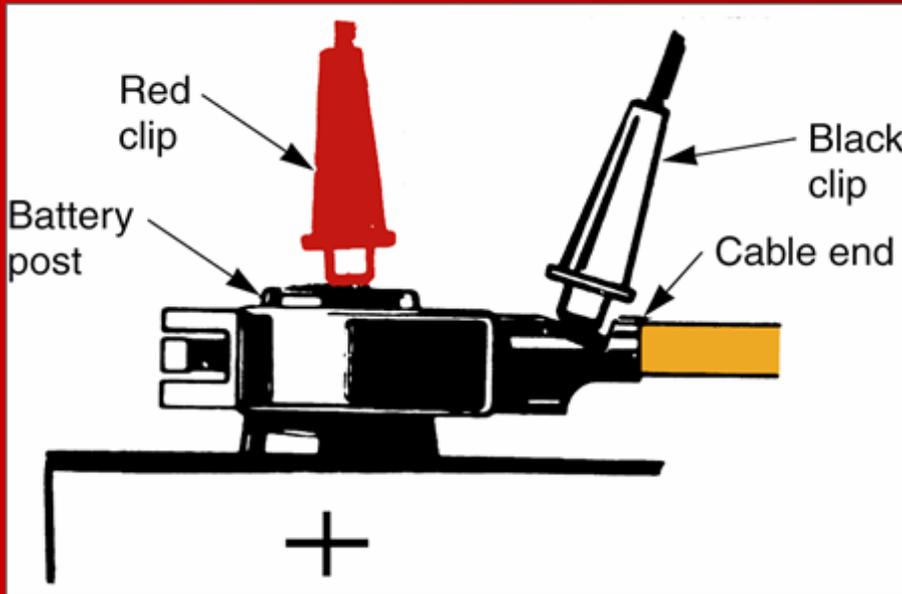


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15. A Humming Sound (Noise) is produced when the motor armature spins rapidly.



Battery Terminal Testing

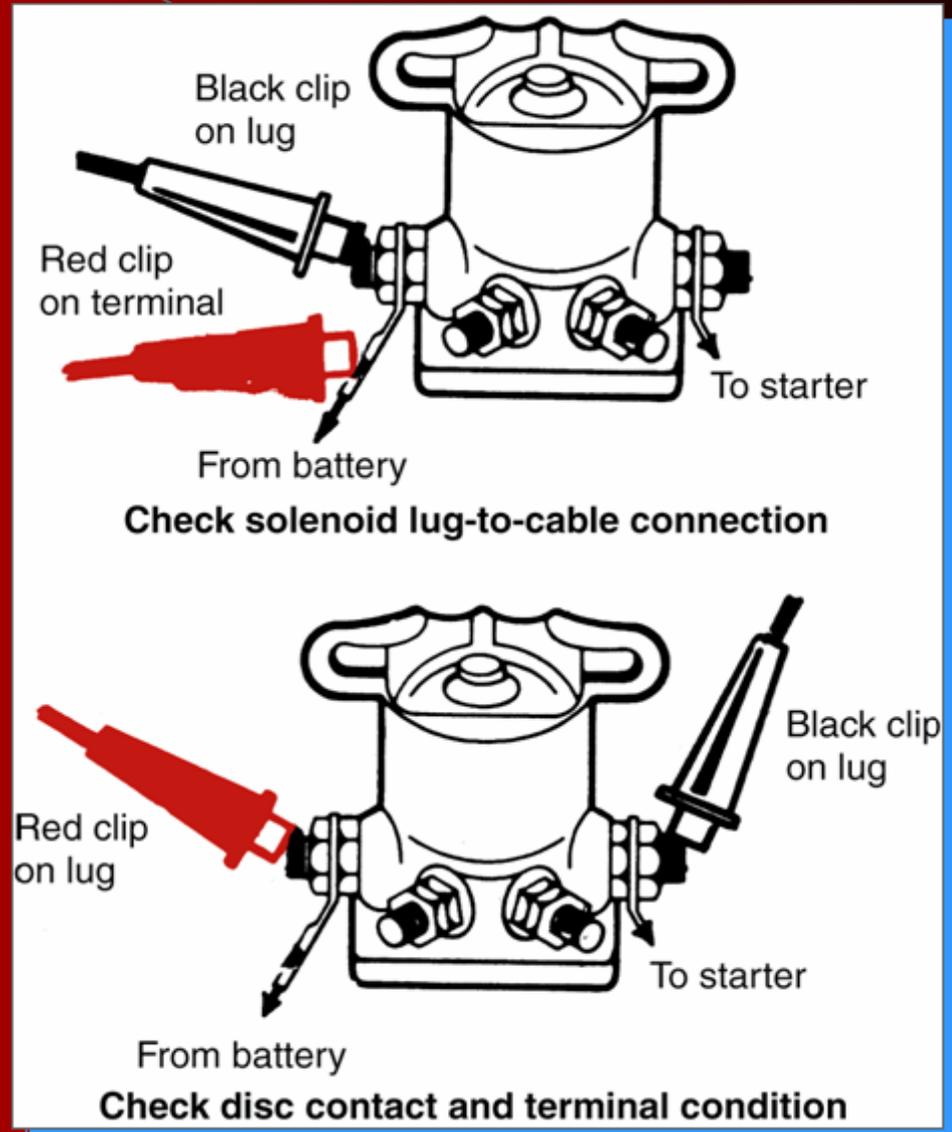


Checking battery terminals for corrosion
and high resistance

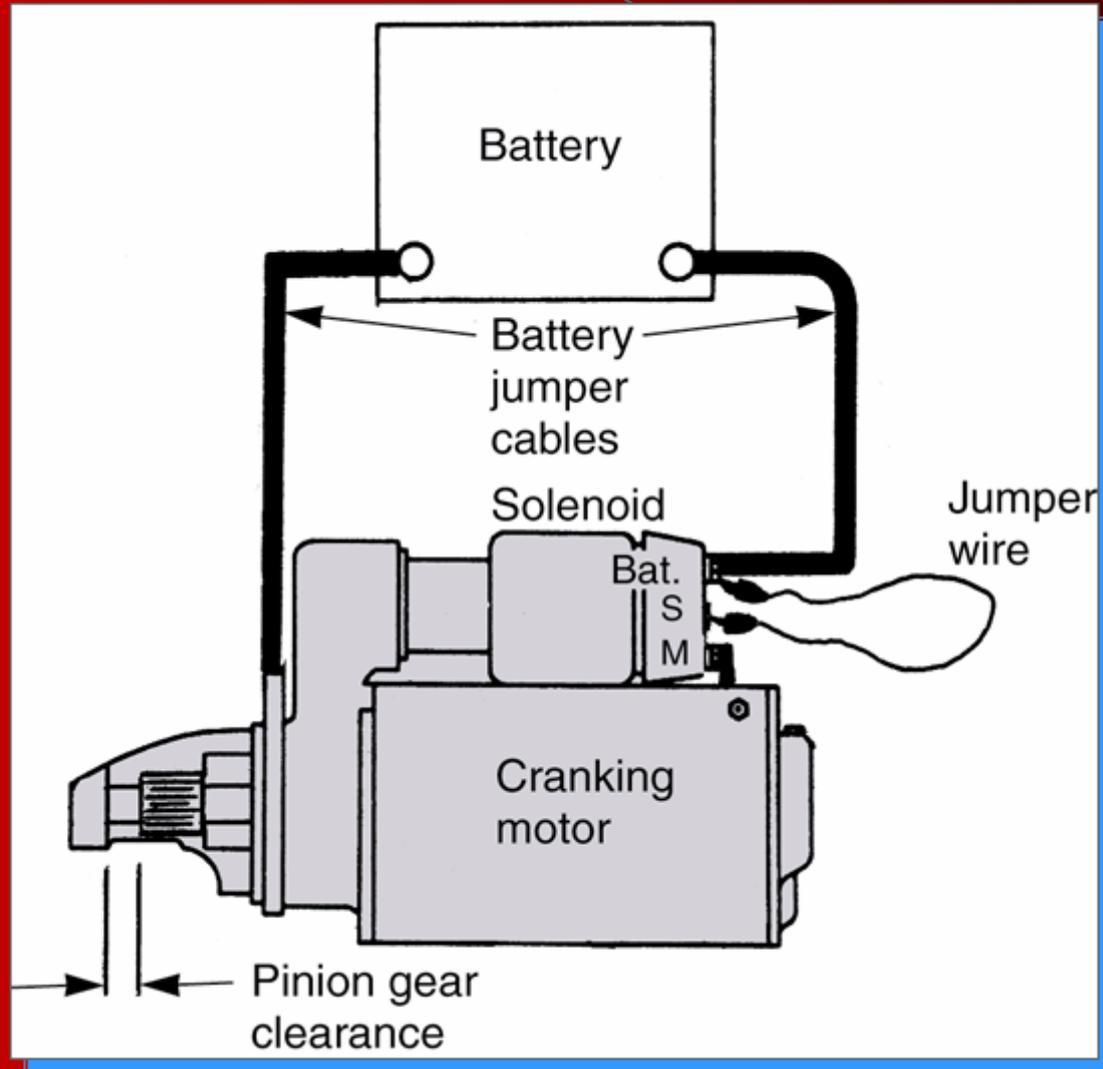


Solenoid Testing

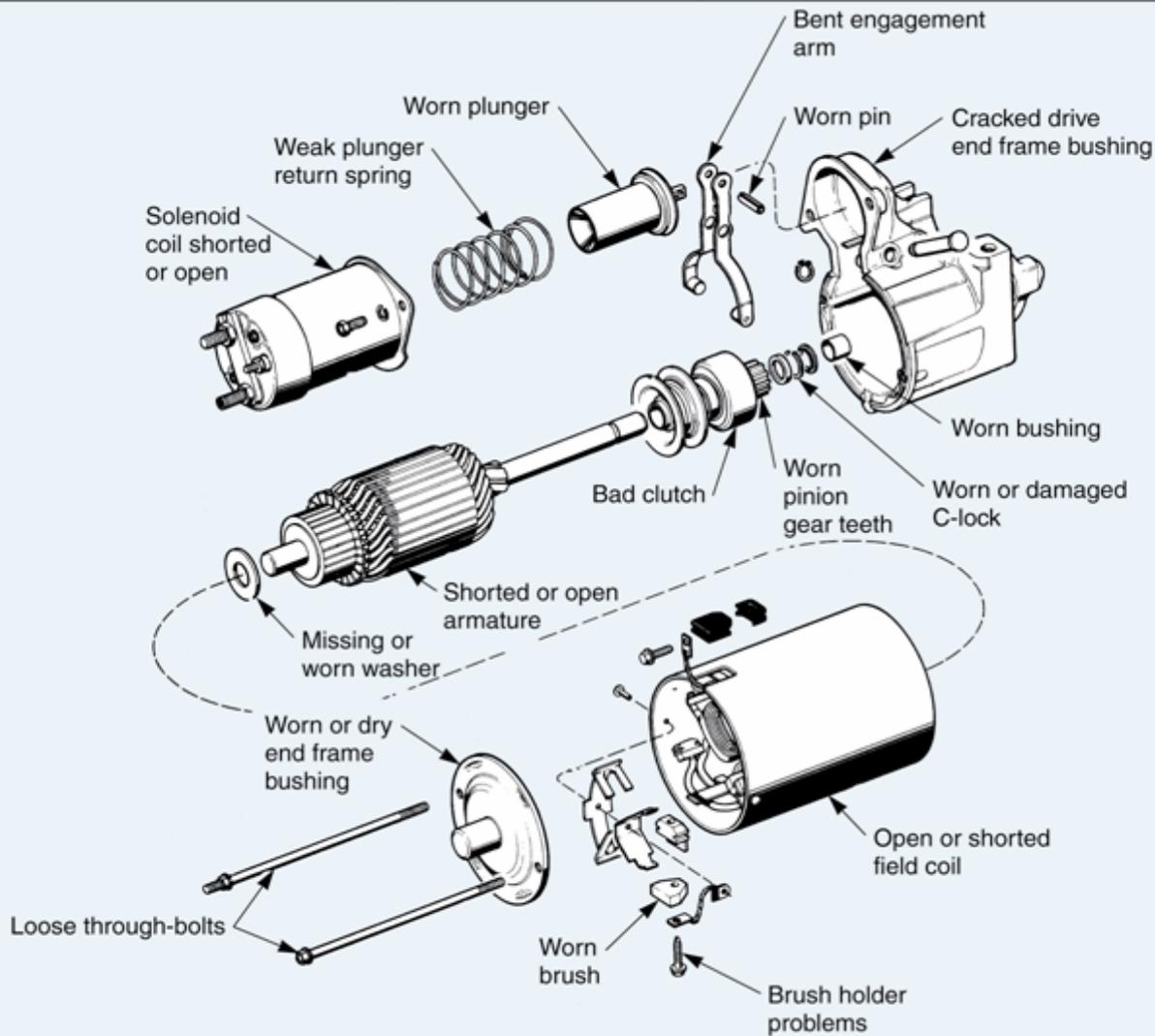
Solenoid (Starter Relay) Testing



Bench Testing



Starter Motor



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