STARTING SYSTEM TEST

STARTING SYSTEM

The battery, starting, and charging systems operate in conjunction with one another, and must be tested as a complete system. For correct starting/charging system operation, all of the components involved in these three systems must perform within specifications.

STARTING SYSTEM DIAGNOSIS

CONDITION	POSSIBLE CAUSE	CORRECTION
STARTER FAILS TO OPERATE	1. Battery discharged or inoperative	1. Charge and test battery (Refer to 08 - Electrical/Battery System/BATTERY/Diagnosis and Testing) . Replace battery, if required.
	2. Starter motor or solenoid inoperative	2. Test the starter motor and solenoid. Replace starter motor, if required.
	3. Starter relay inoperative	3. See Wiring Information. Test and replace the starter relay, if required
	4. Clutch pedal position switch inoperative (if equipped with manual transmission)	4. See Clutch Pedal Position Switch. Test and adjust or replace switch, if required.
	5. Park/Neutral position switch inoperative (if equipped with automatic transmission)	5. See Park/Neutral Position Switch. Test and adjust or replace switch, if required.
	6. Ignition switch inoperative	6. Test the Ignition Switch and Key Lock Cylinder. Replace ignition switch if required.
	7. Starting circuit wiring inoperative	7. See Wiring Information. Test and repair starter feed and/or control circuits, if required.

CONDITION	POSSIBLE CAUSE	CORRECTION
STARTER ENGAGES, BUT FAILS TO TURN ENGINE	1. Battery discharged or inoperative	1. Charge and test battery (Refer to 08 - Electrical/Battery System/BATTERY/Diagnosis and Testing) . Replace battery if required.
	2. Starter motor or solenoid inoperative	2. Test the starter motor and solenoid. Replace starter motor if required.
	3. Starting circuit wiring inoperative	3. See Wiring Information. Test and repair starter feed and/or control circuits, if required.
	4. Engine seized	4. See 9 - Engine. Test and repair engine as required.
STARTER ENGAGES, BUT THEN DISENGAGES BEFORE ENGINE STARTS	1. Starter motor or solenoid inoperative	1. Test the starter motor and solenoid. Replace starter motor, if required.
	2. Starter ring gear damaged	2. Remove starter motor and inspect starter ring gear. Replace starter ring gear, if required.
STARTER DOES NOT DISENGAGE	1. Starter motor incorrectly installed or solenoid inoperative	1. Inspect and test the starter motor and solenoid. Replace starter motor, if required.
	2. Starter relay inoperative	2. See Wiring Information. Test and replace the starter relay, if required.
	3. Ignition switch inoperative	3. Test the Ignition Switch and Key Lock Cylinder. Replace ignition switch, if required.

STARTING SYSTEM TESTING

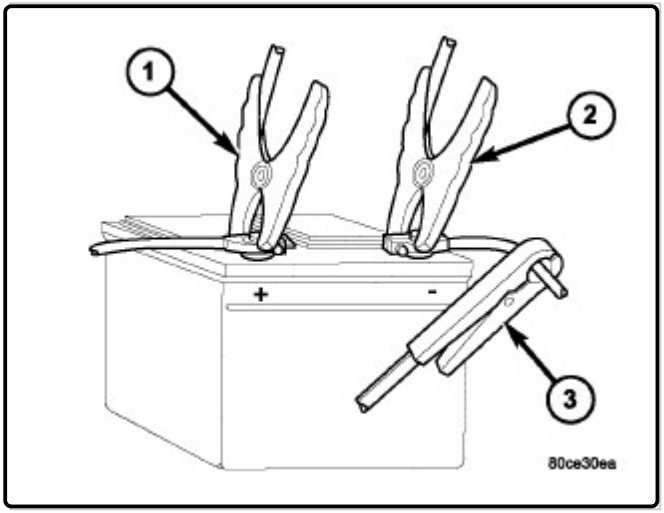
COLD CRANKING TEST

NOTE:
See Wiring Information for complete starter wiring circuit diagrams.

1. Fully charge and load-test the battery (Refer to 08 - Electrical/Battery System/Diagnosis and Testing) .
2. Connect volt-ampere tester leads (1 and 2 to the battery terminals. Connect volt-ampere tester lead (3) arounc the positive battery cable. See instructions provided by manufacturer of volt-ampere tester being used.

3. Place transmission in Park or Neutral with the parking brake set (depending on transmission application).
4. If equipped with manual transmission, block clutch pedal in fully depressed position.
5. Verify that all lamps and accessories are turned off.
6. To prevent a gasoline engine from starting, remove Automatic Shut Down (ASD) relay. To prevent a diesel engine from starting, remove Fuel Pump Relay. See Wiring Information for relay locations.

   WARNING: Attempt to start engine a few times before proceeding with following step.



   NOTE:
   A cold engine will increase starter current (amperage) draw reading, and reduce battery voltage reading.

7. Rotate and hold ignition switch in Start position. Note cranking voltage and current (amperage) draw readings shown on volt-ampere tester.
   a. If voltage reads below 9.6 volts, test the starter. If starter motor is OK, see 9 - Engine for further diagnosis and testing of the engine. If starter motor is not OK, replace the starter motor (Refer to 08 - Electrical/Starting/STARTER/Removal) .
   b. See Feed Circuit Test if voltage reads above 9.6 volts and current (amperage) draw reads below specifications.
   c. See Feed Circuit Test if voltage reads 12.5 volts or greater and starter motor does not turn or turns very slowly.

FEED CIRCUIT TEST

NOTE:
See Wiring Information for complete starter wiring circuit diagrams.

The starter feed circuit test (voltage drop method) will determine if there is excessive resistance in high-amperage feed circuit.

When performing these tests, it is important to remember that voltage drop is giving an indication of resistance between two points at which voltmeter probes are attached.

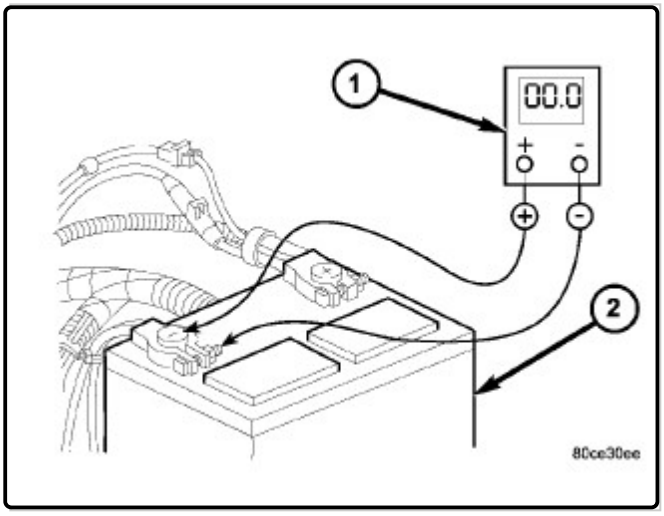
Example: When testing resistance of positive battery cable, touch voltmeter leads to positive battery cable clamp and cable connector at starter solenoid. If you probe positive battery terminal post and cable connector at starter solenoid, you are reading combined voltage drop in positive battery cable clamp-to-terminal post connection and positive battery cable.

The following procedure requires a voltmeter accurate to 1/10 (0.10) volt. Before proceeding, be certain that the following are accomplished:

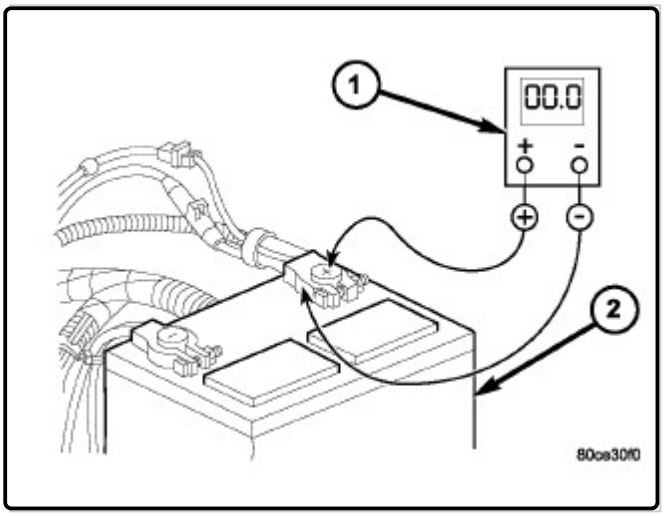
- Fully charge and load-test the battery (Refer to 08 - Electrical/8F - Engine Systems/Battery System - Diagnosis and Testing) .
- Place transmission in Park or Neutral with the parking brake set (depending on transmission application).

- If equipped with manual transmission, block clutch pedal in fully depressed position.
- Verify that all lamps and accessories are turned off.
- To prevent a gasoline engine from starting, remove Automatic Shut Down (ASD) relay. See Wiring Information for relay locations.

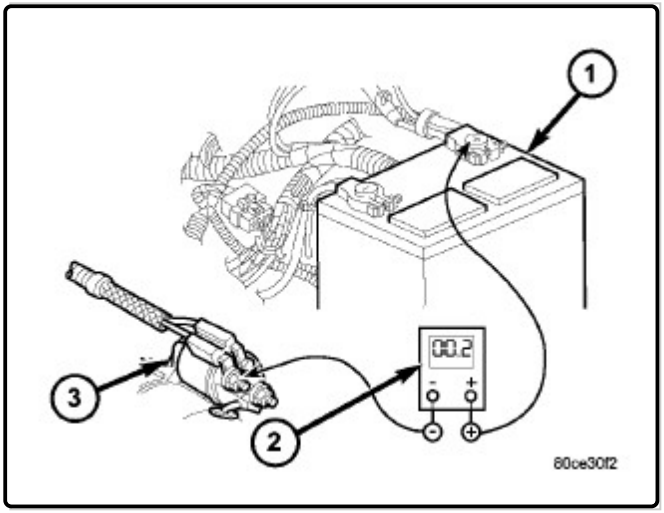
1. Connect positive lead of voltmeter (1) to negative battery cable terminal post. Connect negative lead of voltmeter to negative battery cable clamp. Rotate and hold ignition switch in Start position. Observe voltmeter. If voltage is detected, correct poor contact between cable clamp and terminal post.



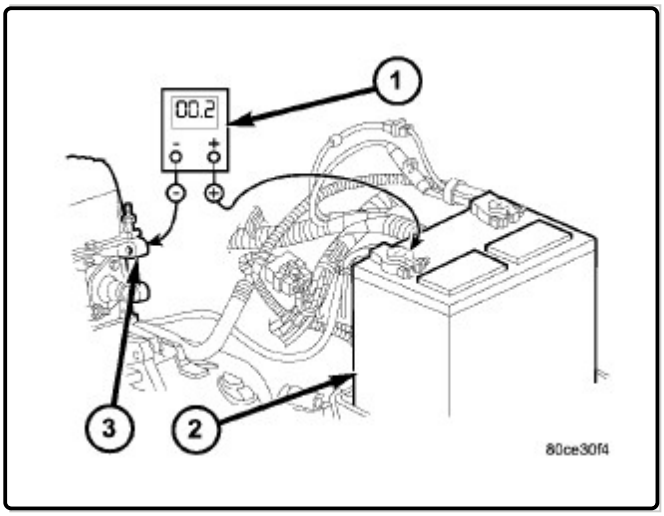
2. Connect positive lead of voltmeter to positive battery terminal post. Connect negative lead of voltmeter to battery positive cable clamp. Rotate and hold ignition switch in Start position. Observe voltmeter. If voltage is detected, correct poor contact between cable clamp and terminal post.



3. Connect voltmeter (2) to measure between positive terminal post on battery (1) and the battery terminal stud on the starter solenoid (3). Rotate and hold ignition switch in Start position. Observe voltmeter. If reading is above 0.2 volt, clean and tighten battery cable connection at solenoid and repeat test. If reading is still above 0.2 volt, replace the positive battery cable.

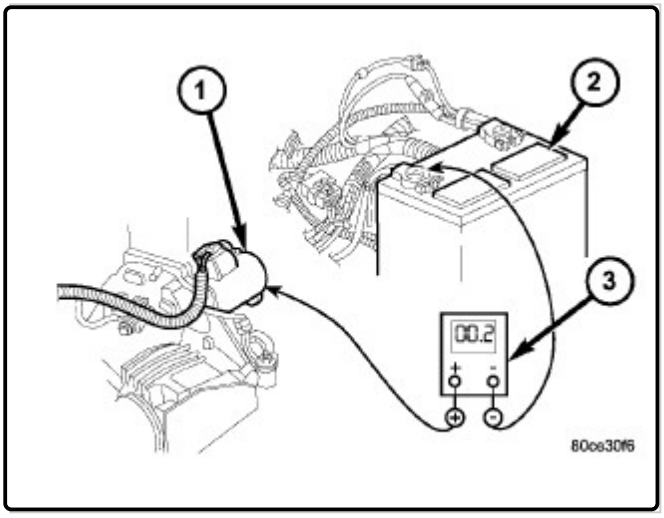


4. Connect voltmeter (1) to measure between negative terminal post on battery (2) and a good clean ground on engine block (3). Rotate and hold ignition switch in Start position. Observe voltmeter. If reading is above 0.2 volt, clean and tighten negative battery cable attachment on engine block and repeat test. If reading is still above 0.2 volt, replace the negative battery cable.



NOTE:
Certain diesel equipped models use dual batteries. If equipped with dual battery system, this procedure must be performed twice, once for each battery.

5. Connect positive lead of voltmeter (3) to starter housing (1). Connect negative lead of voltmeter to negative terminal post on battery (2). Rotate and hold ignition switch in Start position. Observe voltmeter. If reading is above 0.2 volt, correct poor starter to engine block ground contact.



6. If equipped with dual battery system (certain diesel equipped models), connect positive lead of voltmeter to positive battery cable clamp on battery located on left side of vehicle. Connect negative lead of voltmeter to positive battery terminal post on battery located on right side of vehicle. Rotate and hold ignition switch in Start position. Observe voltmeter. If reading is above 0.2 volt, clean and tighten battery cables at both batteries and repeat test. If reading is still above 0.2 volt, replace positive battery cable.
7. If resistance tests detect no feed circuit problems, inspect and test the starter motor and solenoid and replace as needed.