



Component Tests

Starter

Load Test

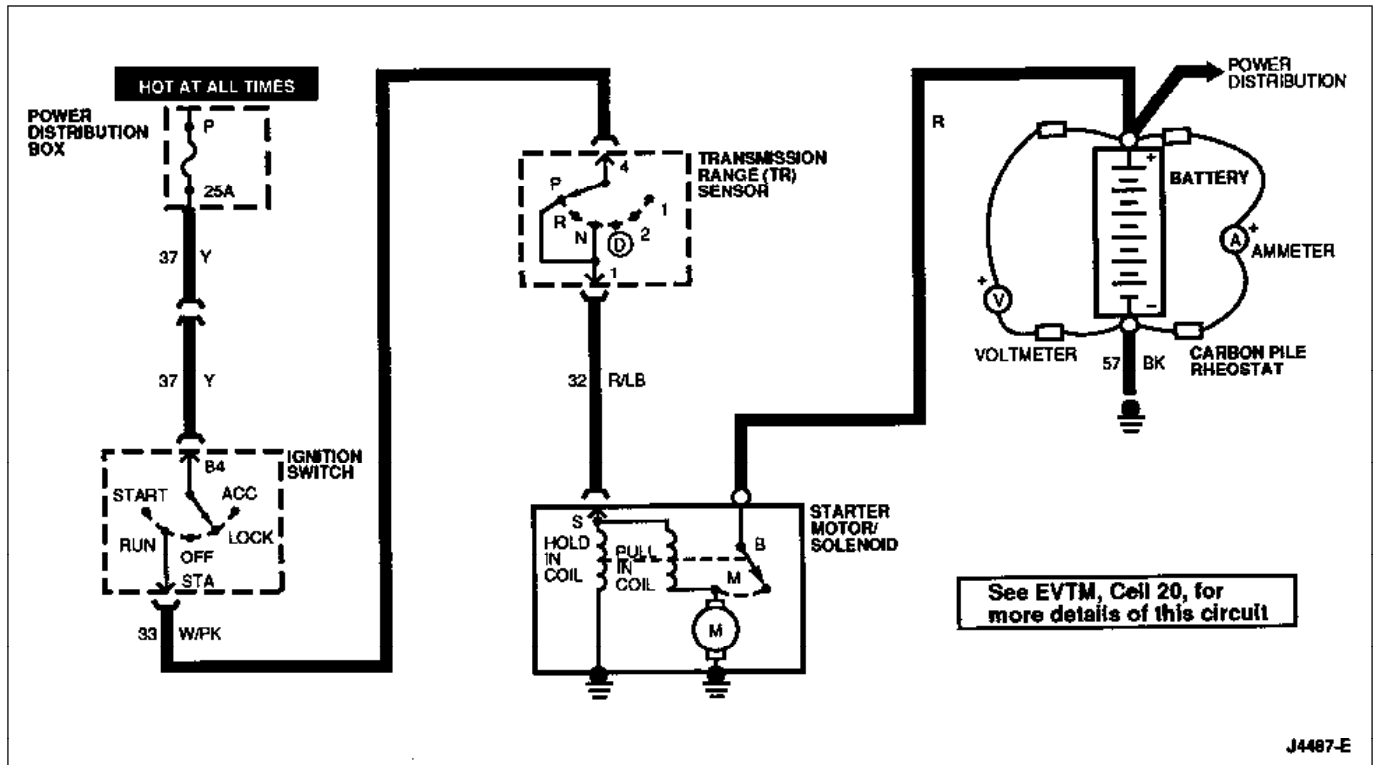
Conduct this test if the starter motor (11002) cranks slowly and also to compare the current to specifications.

1. Connect Rotunda Battery and Starter Tester 010-00725 or equivalent. Make sure that current is not flowing through ammeter and heavy-duty carbon pile rheostat portion of circuit (rheostat at maximum counterclockwise position).
2. Note: Make sure ignition switch is in OFF position and S-terminal connector has been removed so engine does not start.

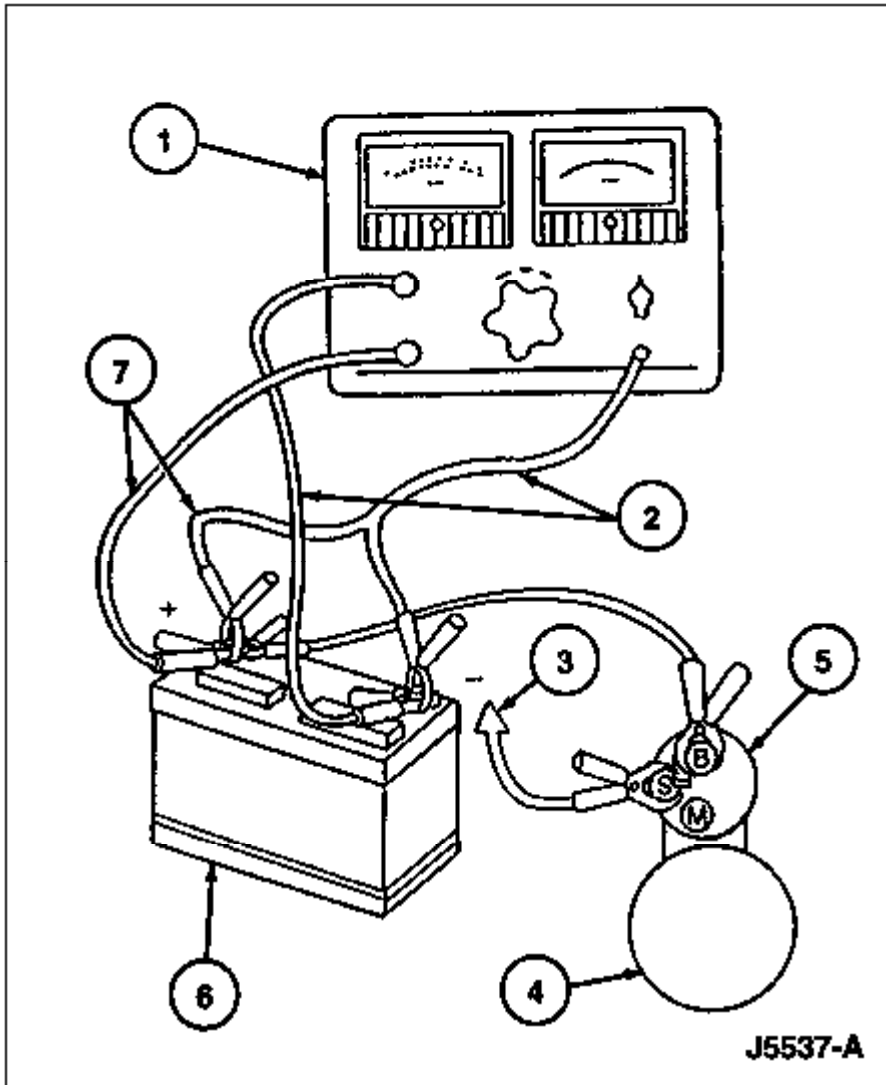
Place transmission in NEUTRAL or PARK. Crank engine with ignition switch OFF and determine exact reading on voltmeter. This test is accomplished by disconnecting push-on connector S at starter solenoid (11390) and connecting a remote-control starter switch from positive battery terminal to S-terminal of starter solenoid.

3. Stop cranking engine. Reduce resistance of carbon pile until voltmeter indicates same reading as that obtained while starter motor cranked the engine. The ammeter will indicate starter current draw under load. Check this with value listed in Starter Specifications.

Load Test Schematic



Starter Load Test



Item	Part Number	Description
1	010-00725	Battery and Starter Tester
2	--	Negative Lead
3	--	To Ignition Switch
4	11002	Starter Motor
5	11390	Starter Motor
6	10655	Battery
7	--	Positive Lead

Voltage Drop Tests

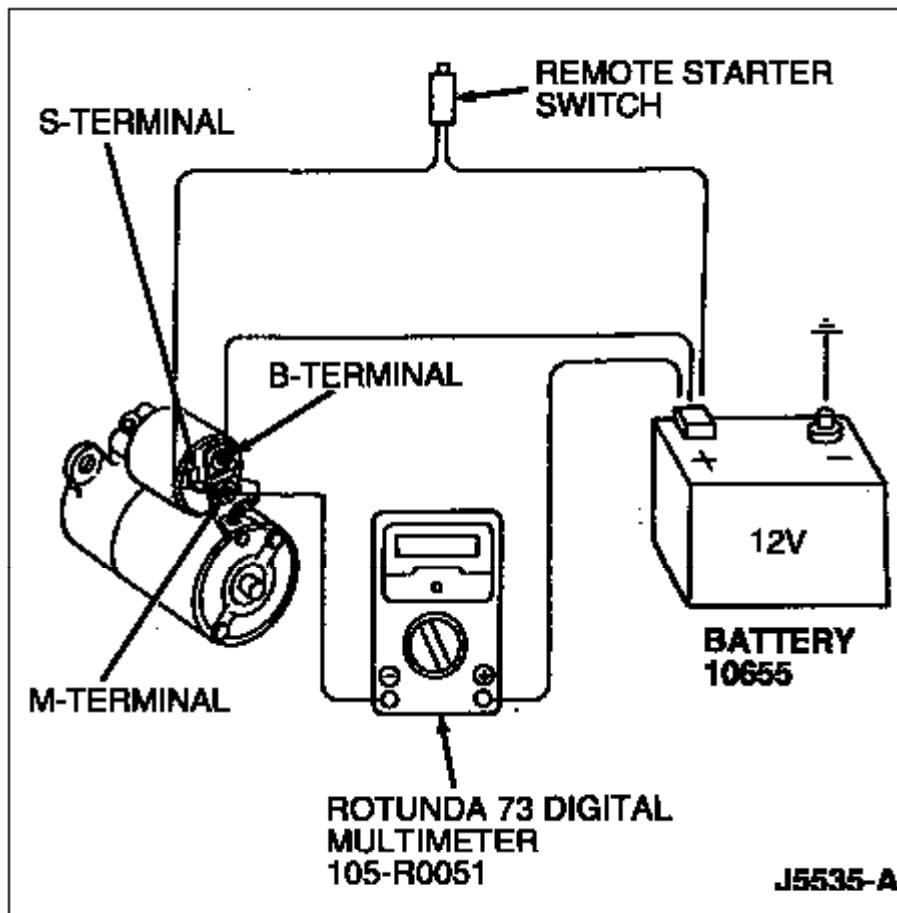
If the starter motor cranks slowly and the battery (10653) is satisfactory, there may be a damage of the starter motor or in the cranking circuit wiring. To determine if the concern is in the wiring, a voltage drop test must be performed.

These tests are performed to determine if there is excessive resistance in the starter motor circuit. Always make the volt-ohmmeter connections at the component terminal rather than at the cable wiring end connector. Making a connection at the wiring end connector could result in false readings because the meter will not pick up a high resistance between the wiring connector and the component.

Motor Feed Circuit

1. Prevent the engine from starting by disconnecting the ignition coil (12029).
2. Connect a remote starter switch between the starter solenoid S-terminal and the battery positive (+) terminal.
3. Connect Rotunda 73 Digital Multimeter 105-R0051 or equivalent positive lead to the battery positive (+) post. Connect multimeter negative lead to the starter solenoid M-terminal.
4. Engage the remote starter switch. Read and record the voltage. The voltage reading should be 0.5 volt or less.
5. If the voltage reading is higher than this, indicating excessive resistance, move the multimeter negative lead to the starter solenoid B-terminal and repeat the test. If the voltage reading at the B-terminal is lower than 0.5 volt, the concern is either in the connections at the solenoid or in the solenoid contacts.
6. Remove the cables from solenoid B-, S-, and M-terminals. Clean the cables and connections and reinstall the cables to the proper terminals. Repeat Steps 1 through 5 above. If the voltage drop reading is still higher than 0.5 volt when checked at the M-terminal or lower when checked at the B-terminal, the concern is in the solenoid contacts. Remove and replace the starter motor or starter solenoid if available.
7. If the voltage reading taken at the solenoid B-terminal is still higher than 0.5 volt after cleaning the cables and connections at the starter solenoid, the concern is either in the positive (+) battery cable connection or in the positive battery cable itself.
8. By moving the multimeter negative lead toward the battery and checking each mechanical connection point, the excessive voltage drop can be located. When the high reading disappears, the last mechanical point that was checked is the concern.

Motor Feed Circuit

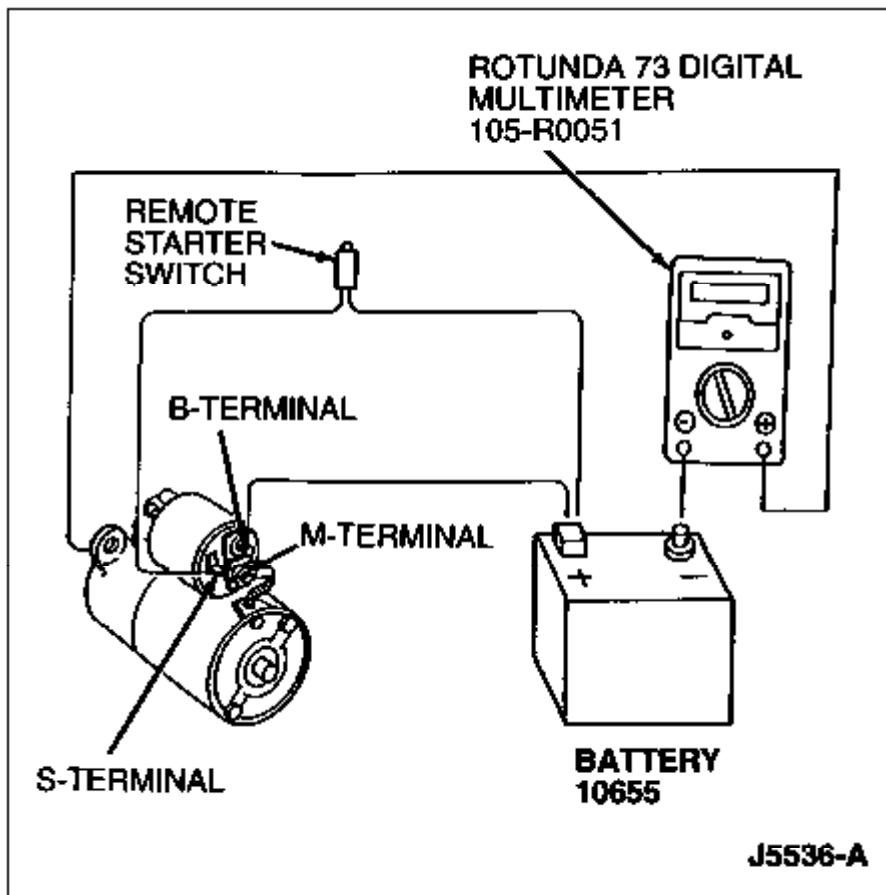


Motor Ground Circuit

A slow cranking condition can be caused by resistance in the ground or return portion of the cranking circuit. Check the voltage drop in the ground circuit as follows:

1. Disconnect the ignition coil to prevent the engine from starting.
2. Connect a remote starter switch between the starter solenoid S terminal and the battery positive (+) terminal.
3. Connect Rotunda 73 Digital Multimeter 105-R0051 or equivalent, set on voltage scale, positive lead to the starter motor housing (connection must be clean and free of rust or grease). Connect digital multimeter negative lead to the negative (-) battery terminal.
4. Engage the remote starter switch and crank the engine. Read and record the multimeter reading. The reading should be 0.2 volt or less.
5. If the voltage drop is more than 0.2 volt, clean the negative cable connections at the battery and body connections and retest. If the voltage drop is still too high, perform the following test:

Motor Ground Circuit



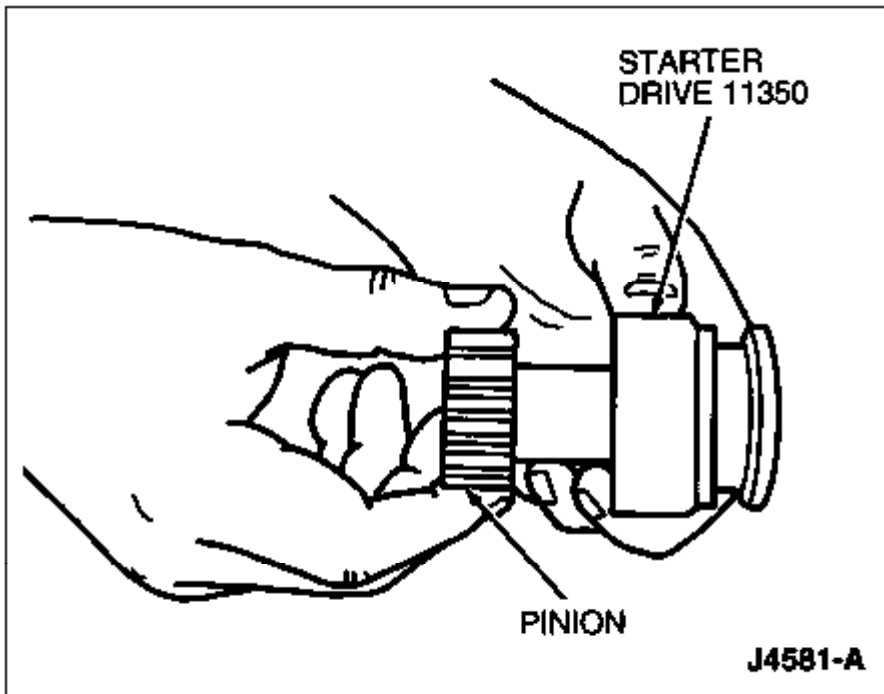
Individual Cable

The resistance of any cable can be checked in the same manner by using Rotunda 73 Digital Multimeter 105-R0051 or equivalent.

1. Determine which way the current is flowing in the cable. Connect Rotunda 73 Digital Multimeter 105-R0051 or equivalent positive lead to the end of the cable nearest battery positive.
2. Connect multimeter negative lead to the terminal at the other end of the cable.
3. Crank the engine and observe multimeter. The voltage reading should be 0.2 volt or lower. If the voltage drop is too high, clean the terminal ends. Retest, and if still high, replace the cable.

Starter Drive Pinion Test

1. Remove [«Starter Motor»](#) as outlined.
2. Disassemble starter drive (11350) from [«Starter Motor»](#) as outlined.
3. Turn the starter drive pinion by hand and hold the overrunning clutch. Replace the starter drive if the pinion turns in both directions or does not turn.



No Load Test

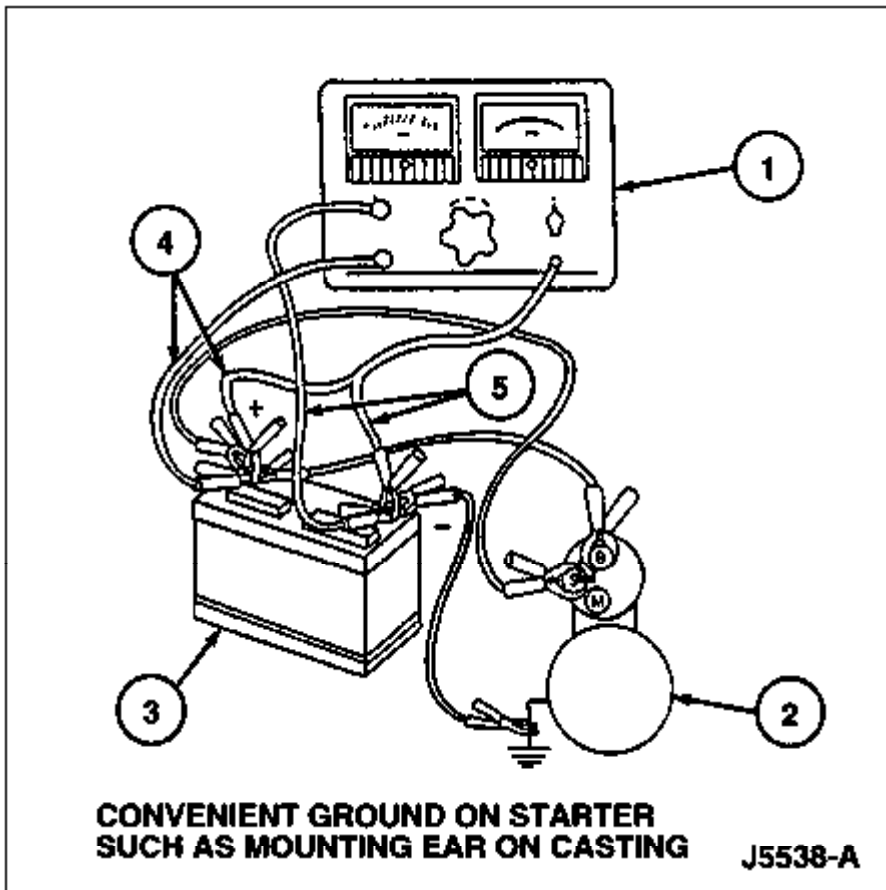
CAUTION:

Make sure that the starter motor is securely mounted in bench vise while energizing, as starter motor will move or jump.

The starter no-load test will uncover such conditions as open or shorted windings, or rubbing starter motor armature (11005). The starter motor can be tested at no-load, on the test bench only.

1. Note: A remote control starter switch should be used in the S 1-1 circuit for turning the starter motor ON and OFF during testing.

Make test connections with Rotunda Battery and Starter Tester 010-00725 or equivalent cables connected to starter motor, large enough to carry high current (the same as in the vehicle). The starter motor will run at no-load. Be sure that no current is flowing through ammeter (rheostat at maximum counterclockwise position). Determine exact reading on voltmeter.



Item	Part Number	Description
1	010-00725	Rotunda Battery and Starter Tester
2	11002	Starter Motor
3	10655	Battery
4	-	Positive Leads
5	-	Negative Leads

- Disconnect starter motor from battery. Then reduce resistance of rheostat until voltmeter indicates same reading as that obtained while starter motor was running. The ammeter will indicate starter motor no-load current draw. Refer to Starter «Specifications» at the end of this section for a comparative value.
- If current exceeds specification, check for rubbing starter motor armature, bent output shaft (11355), binding bushings, or shorts in starter motor armature or brush holder (11061).

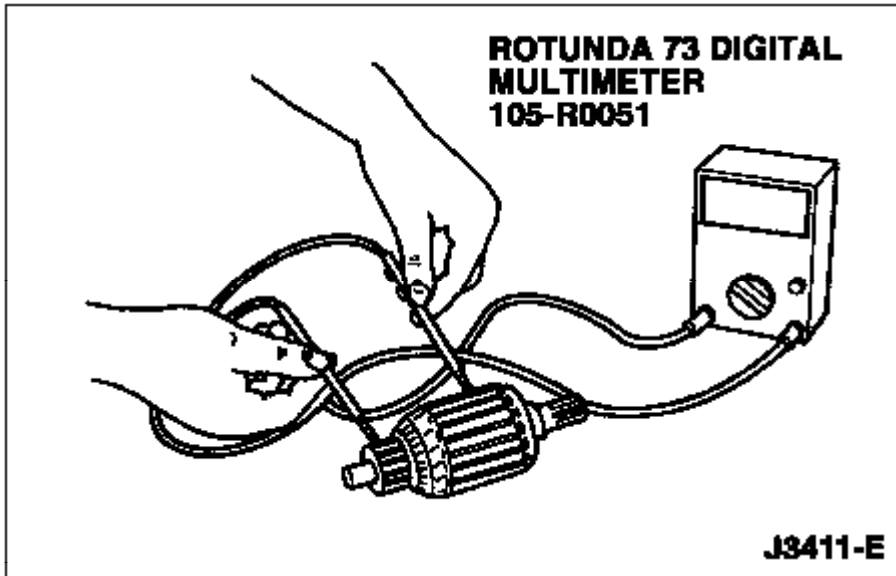
Armature

Open Circuit Test

An open circuit starter motor armature may sometimes be detected by examining the commutator for evidence of burning. A burn spot on the commutator is caused by an arc formed every time the commutator segment, connected to the open circuit winding, passes under a brush.

Grounded Circuit Test

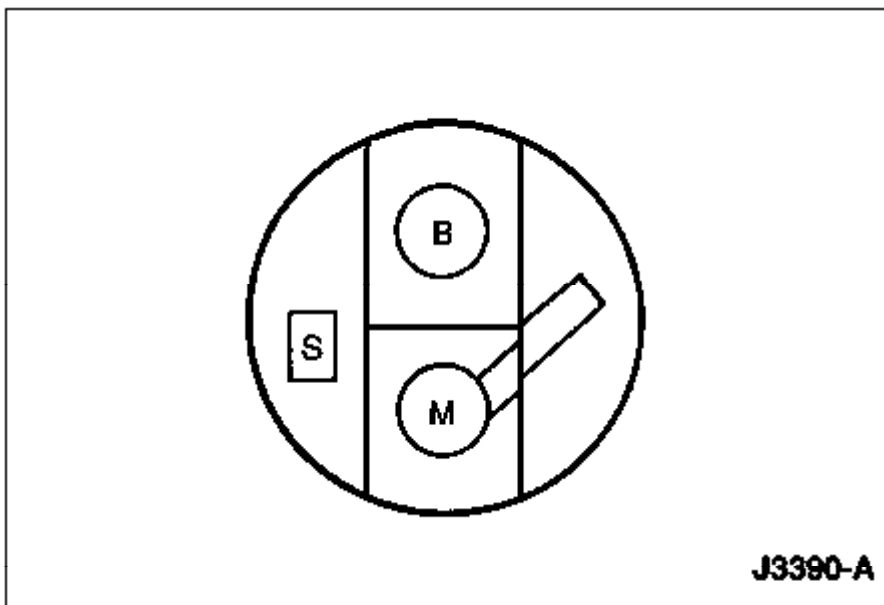
This test will determine if the winding insulation has been damaged, permitting a conductor to touch the starter frame and magnet (11075) or armature core. To determine if the armature windings are grounded, check with Rotunda 73 Digital Multimeter 105-R0051 or equivalent. Infinite resistance indicates a normal condition.



Starter Solenoid

Make sure that the starter solenoid is isolated electrically from the starter motor. Using a Rotunda 73 Digital Multimeter 105-R0051 or equivalent, check for continuity between S-terminal and M-terminal, and between S-terminal and ground (starter frame and magnet). If there is no continuity, the following conditions may exist:

1. Open wire; replace starter solenoid.
2. Ice, dirt or other foreign material preventing contact; service as necessary.



Solenoid S-Terminal Circuit Resistance

Using Rotunda 73 Digital Multimeter 105-R0051 or equivalent, check the resistance of the entire S-terminal circuit, including all the switches, wires and connections. Resistance should be less than 0.08 ohm.

Solenoid M-Terminal

1. Using Rotunda 73 Digital Multimeter 105-R0051 or equivalent, check for continuity between the starter solenoid M-terminal and the starter solenoid housing.
2. If there is no continuity, replace the starter solenoid.

