

DELCO-REMY ENCLOSED HOUSING

General Motors

DESCRIPTION

Starting motors are 12 volt units with enclosed solenoid, shift lever and overrunning clutch drive. Internal field coil circuits are wired differently for various engine sizes depending on cranking loads.

TESTING

STARTER TROUBLE DIAGNOSIS

NOTE — Starter interlock system must be checked if a no start condition exists. See Seat Belt Starter Interlock in ACCESSORIES & EQUIPMENT Section.

No Cranking Action — Determine if problem is in battery, interlock or starter motor. Check battery condition and cables. Sitting in driver's seat, fasten seat belt and turn ignition switch to start. Shift lever must be in "P" or "N", or clutch pedal depressed depending on transmission type, in order to start engine. If starter does not crank, leave ignition switch on, depress and release starter interlock override button in engine compartment and turn ignition switch to start position. If engine cranks, fault is in interlock system and not starter. If engine does not crank, check neutral start switch adjustment, wires or starter motor failure.

Cranking Speed Low — Check condition of battery, cables, solenoid switch, starter motor or an internal condition of engine.

STARTER CRANKING CIRCUIT TESTS

1) With engine at normal operating temperature, ground distributor terminal of coil so engine will not start. Connect voltmeter positive lead to motor terminal on solenoid and ground negative lead. Crank engine and read voltmeter; if cranking speed is normal and voltage is 9 volts or more, system is satisfactory. If cranking speed is below normal and voltage is 9 volts or greater, starter is defective.

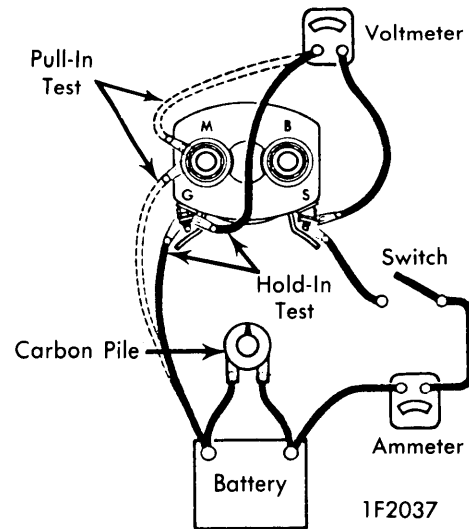
2) If starter turns engine slow with 9 volts or less, test voltage across solenoid switch contacts. Connect a 12 volt meter negative lead to solenoid motor terminal and positive lead to battery terminal of switch. Crank engine and immediately turn voltmeter switch to low scale, take reading, then turn switch back to high scale before stopping engine. Voltage drop must not exceed .2 volt for contacts to be satisfactory.

SOLENOID WINDINGS TEST

NOTE — Tests are performed with all leads disconnected. Complete tests in minimum amount of time to prevent overheating solenoid.

Hold-In Winding — Connect test equipment as shown in illustration. Use carbon pile to decrease battery voltage to 10 volts. Ammeter should read 14.5 to 16.5 Amps. If amperage is above 16.5 Amps., winding is shorted or grounded. Amperage draw below 14.5 Amps. indicates excessive resistance.

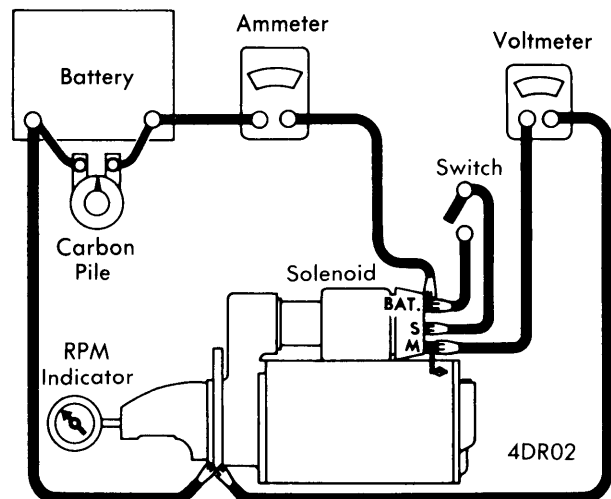
Pull-In & Hold-In Winding — Ground the "MOT" or "M" terminal and connect a 10 volt source (in series with ammeter) to solenoid switch terminal and ground. Current draw should be 40.5-47.5 amps.



SOLENOID WINDING TEST CONNECTIONS

STARTER NO LOAD TEST

To perform test, connect starter as shown in illustration. To obtain voltage specified in Delco-Remy Starter Specifications, adjust carbon pile. Then read current draw and armature speed and compare these readings with specifications. **CAUTION** — Do not apply voltage greater than specified; excessive voltage may cause armature to throw windings because of excessive speed.



STARTER NO LOAD TEST CONNECTIONS

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DELCO-REMY STARTER SPECIFICATIONS			
Delco-Remy Number	No Load Test ①		
	Amps.	RPM	Volts
1108195	50-75	6,500-10,000	9
1108196	50-75	6,500-10,000	9
1108365	50-80	5,500-10,000	9
1108418	65-95	7,500-10,000	9
1108430	65-95	7,500-10,500	9
1108512	55-80	3,500-6,000	9
1108516	55-80	3,500-6,000	9
1108517	45-80	4,000-6,000	9
1108518	65-95	7,500-10,000	9
1108745	50-80	5,500-10,000	9
1108758	.....	.....	9
1108759	.....	.....	9
1108760	.....	.....	9
1108761	.....	.....	9
1108762	55-80	3,500-6,000	9
1108763	45-80	4,000-6,500	9
1108765	55-80	3,500-6,000	9
1108766	.....	.....	9
1108767	.....	.....	9
1108770	50-80	5,500-10,500	9
1108771	50-75	6,500-10,000	9
1108772	50-75	6,500-10,000	9
1108773	.....	.....	9
1108774	50-80	5,500-10,500	9
1108775	65-95	7,500-10,500	9
1108776	65-95	7,500-10,500	9
1108778	.....	.....	9
1108790	55-80	3,500-6,000	9
1109520	.....	.....	9

① — Some model specifications were not available at time of publication.

OVERHAUL

DISASSEMBLY

- 1) Disconnect field lead strap from solenoid by taking out terminal screw. Remove two through bolts, withdraw commutator end frame and field frame by pulling these parts off the armature. Remove thrust washer from commutator end of armature shaft.
- 2) Pull out brush holder pivot pin and remove two brush holders and spring as an assembly. Remove brushes by taking out screws attaching brushes and leads to holder.
- 3) Remove two solenoid attaching screws and remove solenoid from drive housing. To remove solenoid cover for switch inspection, remove nuts and insulating washers from solenoid "S" and "BAT" terminals, remove cover.
- 4) Remove shift lever fulcrum bolt, remove shift lever, plunger, and return spring from end housing. Withdraw armature assembly. Remove thrust collar from pinion end of armature shaft.
- 5) To remove drive assembly from armature shaft, install piece of correct size tubing over end of shaft and against pinion stop retainer, tap retainer toward armature to uncover snap ring. Remove snap ring from groove in shaft, then slide retainer and drive assembly off shaft.

CLEANING

Clean all parts by wiping with clean cloths. Do not clean armature, field coils, or drive assembly in any type of grease dissolving solvent (will damage insulation and wash lubricant out of drive assembly).

PARTS REPLACEMENT & TESTING

Armature - Test armature for shorted coils with a growler. Check for grounded coils with a 110 volt test lamp. Place one test lead on armature core or shaft, and other test lead on commutator. Lamp should not light. If lamp lights, armature is grounded and should be replaced. Inspect commutator. If commutator worn, out-of-round, or has high insulation, turn down commutator in a lathe, undercut insulation 1/32" deep and square across entire width, sand commutator lightly with 00 sandpaper and clean out slots carefully.

CAUTION - Some starters have molded type commutator and insulation must not be undercut on these models (may cause serious damage to commutator).

Field Coils - Check with 110 volt test light. Place one test lead on field coil terminal strap, touch other test lead to field coil brush lead (check series coils and shunt coils separately at appropriate terminals). Lamp should light. If lamp does not light, coils are open. Check for grounds by placing one test lead on field terminal strap, touch other test lead to armature core or shaft. (**CAUTION** - Shunt coil ground lead must be disconnected and all field terminals insulated from frame when making this test). If lamp lights, one or more coils are grounded.

Brushes, Springs, & Holders - Replace brushes if worn to one-half original length, or if oil-soaked or pitted. Check brush spring tension and replace springs if weak or distorted. Deformed or bent brush holders can be replaced by service units which are installed with screws and nuts.

Brush Spring Tension

Application	Tension
All	35 ozs.

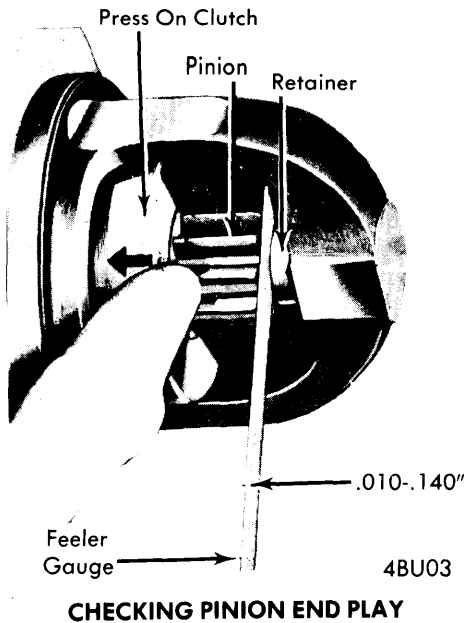
PINION CLEARANCE CHECK

Connect an electrical source of approximately 6 volts between solenoid "S" terminal and ground, **CAUTION** - Do not use more than 6 volts or motor will operate. As a further precaution, connect a heavy jumper wire from solenoid motor terminal to ground. After energizing solenoid, push pinion away from stop retainer as far as possible and use feeler gauge to check clearance between pinion and retainer.

Clearance should be .010"-.140". **NOTE** - Pinion clearance is not adjustable. If clearance not within specifications, motor must be disassembled and checked for defects.

Starters

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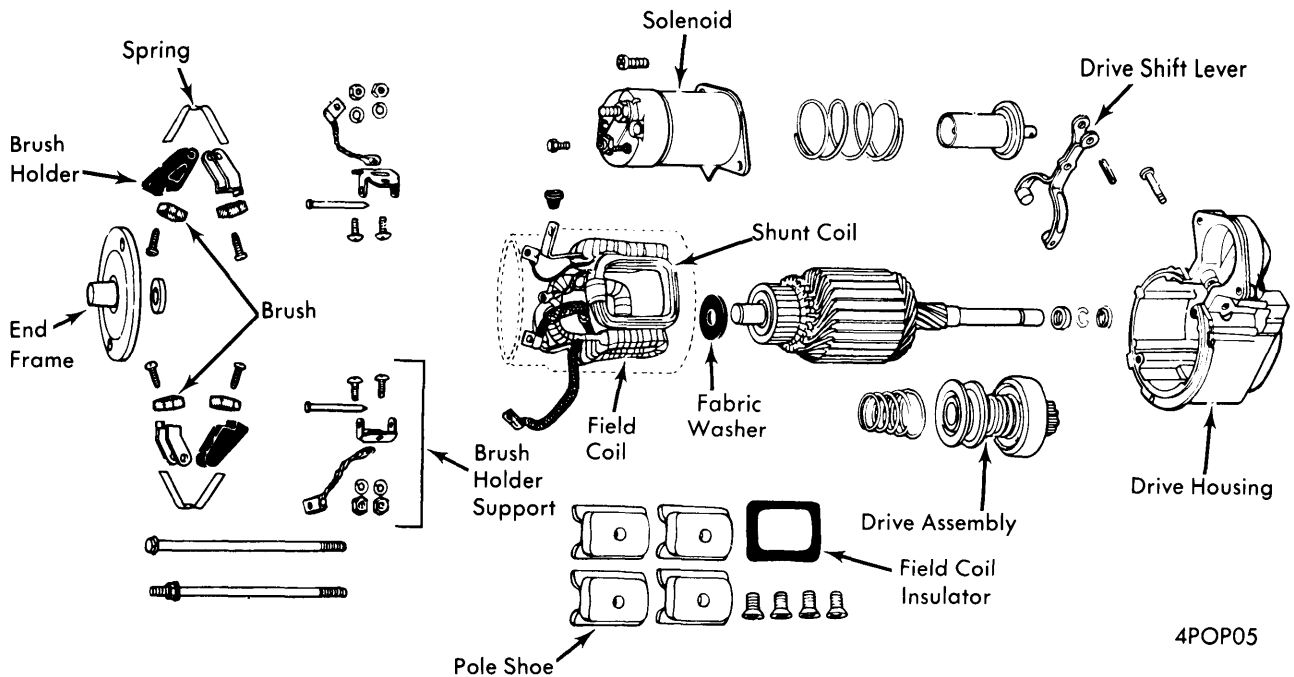
CHECKING PINION END PLAY

Overrunning Clutch – Clutch pinion should turn freely in one direction only. Check pinion teeth for chipped, cracked or excessive wear. Chipped teeth may indicate a defective ring gear. Test overrunning clutch for slipping while still attached to armature. Wrap armature with a shop towel and clamp in suitable vise. With a $\frac{1}{16}$ " 12 point deep socket and torque wrench, clutch should not slip up to 50 ft. lbs. If it slips, replace clutch.

Armature Shaft Bushings - Inspect armature shaft bearing surfaces and check for wear by noting sideplay with shaft inserted in bushings. Drive end bushing can be replaced. Replace commutator end plate assembly if bushing worn.

REASSEMBLY

- 1) Lubricate armature shaft with silicone lubricant or few drops of SAE 10 engine oil, install drive assembly on shaft, install retainer with cupped side out or away from pinion, install lock ring in shaft groove, install thrust collar with shoulder against lock ring. Position retainer on lock ring by using two pliers at opposite points to squeeze retainer and thrust collar together against lock ring.
- 2) Assemble brush holders and install brushes, connect field leads to proper brushes, check assemblies for free movement.
- 3) Assemble solenoid plunger on shift lever. Lubricate drive housing bushing with silicone lubricant or few drops of SAE 10 engine oil. Install armature and drive assembly in drive housing with shift lever engaged in drive collar, install shift lever pin. Coat both sides of solenoid flange which extends down between drive housing and field frame with suitable sealer (No. 1050026), place return spring over plunger and install solenoid, tighten solenoid attaching screws securely.
- 4) Align field frame dowel with dowel hole in drive housing, install field frame over armature and against end housing (**CAUTION** - Lift brushes up over commutator as field frame installed to prevent damage to brushes).
- 5) Install thrust washer (leather brake washer) on end of armature shaft. Lubricate commutator end frame bushing with silicone lubricant or few drops of SAE 10 engine oil, install end frame, install through bolts and tighten securely.



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STARTER MOTOR ASSEMBLY