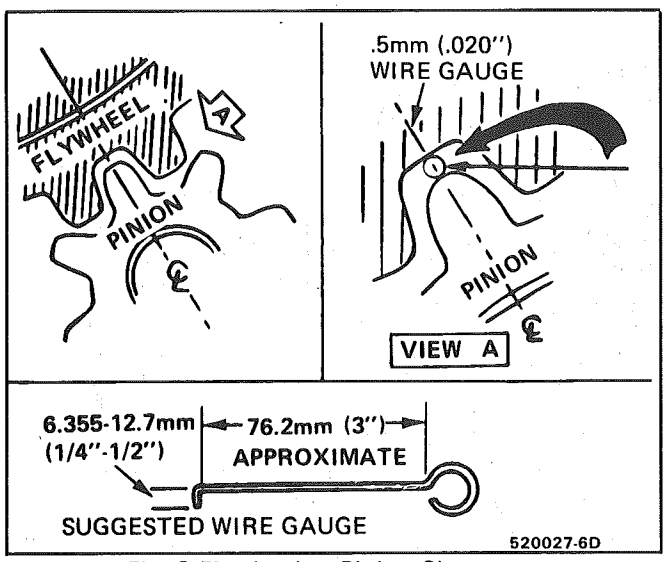


Fig. 3 Flywheel to Pinion Clearance

SERVICE PROCEDURES

CRANKING SYSTEM

Starting motors do not require lubrication except during overhaul.

When the motor is disassembled for any reason, lubricate as follows:

5MT and 10 MT Starters

1. The roll type overrunning clutch requires no lubrication; however, the drive assembly should be wiped clean. **Do Not** clean in any degreasing tank, or with grease dissolving solvents; this will dissolve the lubricant in the clutch mechanism. Use silicon grease General Electric CG321, Dow Corning 33 Medium, or equivalent, on the shaft underneath the overrunning clutch assembly.
2. Avoid excessive lubrication.

1–CONTACT DISC
2–PLUNGER
3–SOLENOID
4–RETURN SPRING
5–SHIFT LEVER
6–BUSHING
7–PINION STOP
8–CLUTCH
9–FIELD COIL
10–ARMATURE
11–BRUSH
12–TERMINALS

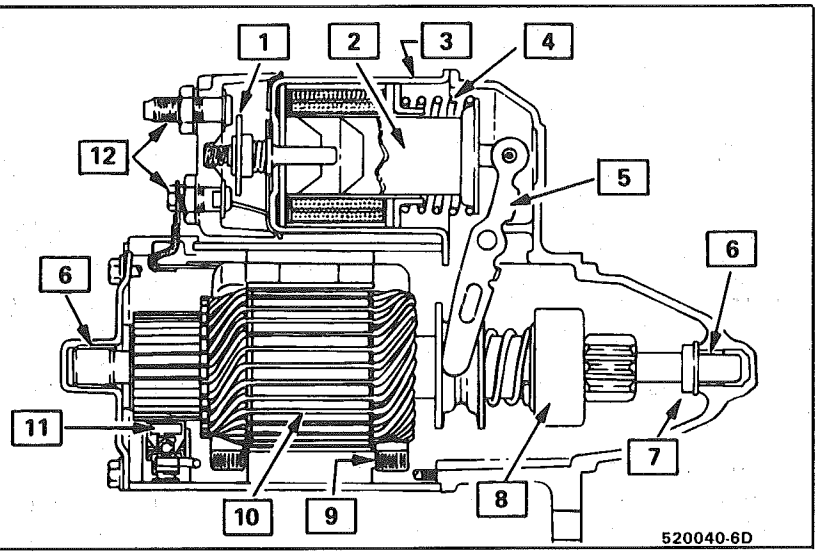
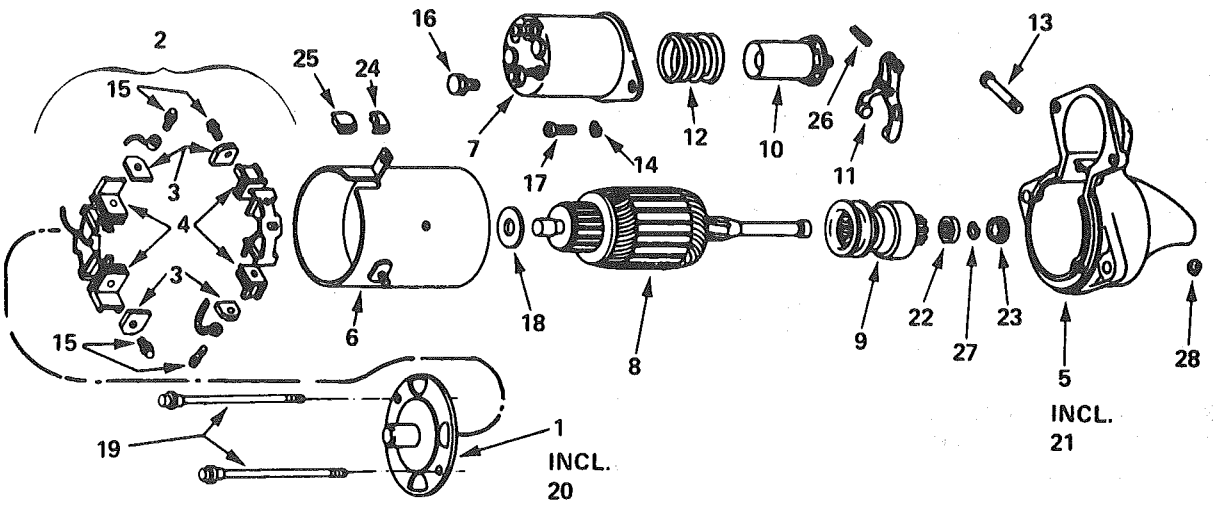


Fig. 4 Cross Section of 5MT Starting Motor

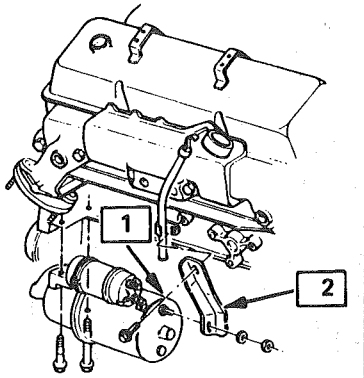


1-FRAME-COMMUTATOR END	10-PLUNGER	19-THRU BOLT
2-BRUSH AND HOLDER PKG.	11-SHIFT LEVER	20-BUSHING-COMMUTATOR END
3-BRUSH	12-PLUNGER RETURN SPRINGER	21-BUSHING-DRIVE END
4-BRUSH HOLDER	13-SHIFT LEVER SHAFT	22-PINION STOP COLLAR
5-HOUSING-DRIVE END	14-LOCK WASHER	23-THRUST COLLAR
6-FRAME AND FIELD ASM.	15-SCREW-BRUSH ATTACHING	24-GROMMET
7-SOLENOID SWITCH	16-SCREW-FIELD LEAD TO SWITCH	25-GROMMET
8-ARMATURE	17-SCREW-SWITCH ATTACHING	26-PLUNGER PIN
9-DRIVE ASM.	18-WASHER-BRAKE	27-PINION STOP RETAINER RING
		28-LEVER SHAFT RETAINING RING

520041-6D

Fig. 4A 5MT Starting Motor - Disassembled View

ON-CAR SERVICE



1-STARTER

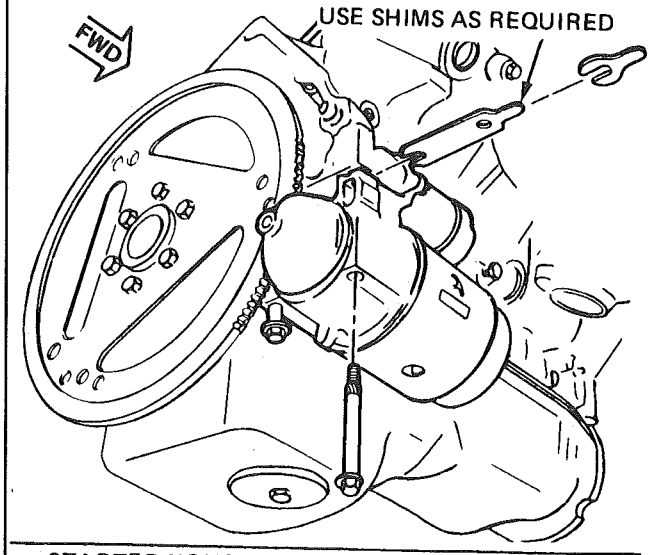
2-BRACE
(4.3L & 5.0L)

H20248-6D

Fig. 601 Starter Motor Mounting VIN F, H, 8

Starting motors do not require lubrication except during overhaul. When the motor is disassembled for any reason, lubricate as follows:

1. The roll-type overrunning clutch requires no lubrication. However, the drive assembly should be wiped clean. DO NOT clean in any degreasing tank or with grease dissolving solvents; this will dissolve the lubricant in the clutch mechanism. Use silicone grease General Electric CG321, Dow



STARTER NOISE DIAGNOSTIC PROCEDURE

1. STARTER NOISE DURING CRANKING: REMOVE 1 – .015" DOUBLE SHIM OR ADD SINGLE .015" SHIM TO OUTER BOLT ONLY.
2. HIGH PITCHED WHINE AFTER ENGINE FIRES: ADD .015" DOUBLE SHIMS UNTIL NOISE DISAPPEARS.

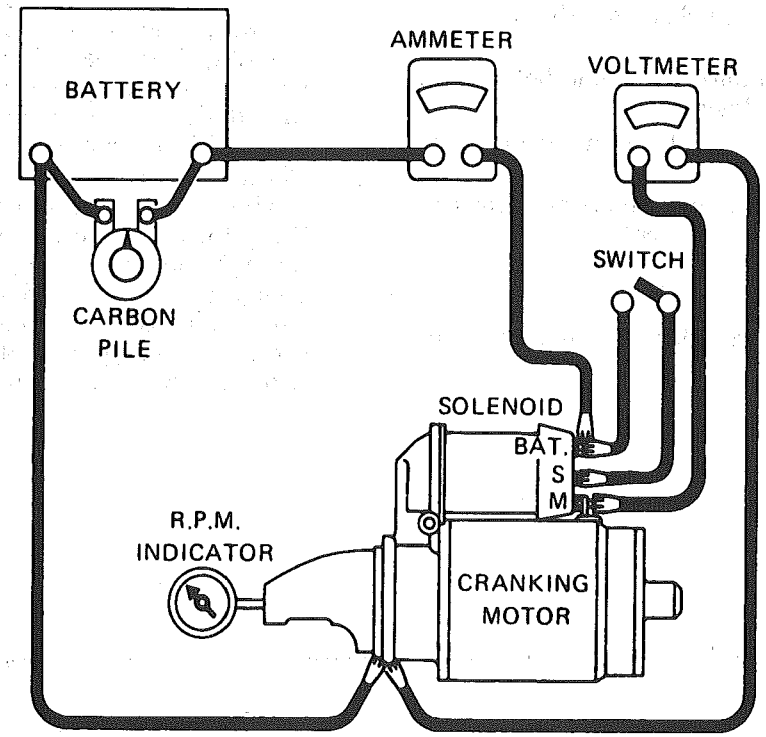
SEE TEXT FOR COMPLETE PROCEDURE.

520171-6D

Fig. 602 Starter Motor Shims

5MT AND 10MT STARTER MOTORS DISASSEMBLY, TEST AND REASSEMBLY (STARTER REMOVED FROM ENGINE)

NO-LOAD TEST



With the starter motor removed from the engine, the pinion should be checked for freedom of operation by turning it on the screw shaft. The armature should be checked for freedom of rotation by prying the pinion with a screwdriver. If the armature does not turn freely, the motor should be disassembled immediately. However, if the armature does rotate freely, the motor should be given a no-load test before disassembly.

Make connections as shown. Close the switch and compare the RPM, current, and voltage readings with the specifications If the specified current draw does not include the solenoid, deduct from the ammeter reading the specified current draw of the solenoid hold-in winding. Make disconnections only with the switch open. Use the test results as follows:

1. Rated current draw and no-load speed indicates normal condition of the starter motor.

2. Low free speed and high current draw indicates:

- Too much friction — tight, dirty, or worn bearings, bent armature shaft allowing armature to drag.
- Shorted armature. This can be further checked on a growler after disassembly.
- Grounded armature or fields. Check further after disassembly.

3. Failure to operate with high current draw indicates:

- A direct ground in the terminal or fields.
- "Frozen" bearings (this should have been determined by turning the armature by hand).

4. Failure to operate with no current draw indicates:

- Open field circuit. This can be checked after disassembly by inspecting internal connections and tracing circuit with a test lamp.
- Open armature coils. Inspect the commutator for badly burned bars after disassembly.
- Broken brush springs, worn brushes, high insulation between the commutator bars or other causes which would prevent good contact between the brushes and commutator.

5. Low no-load speed and low current draw indicates:

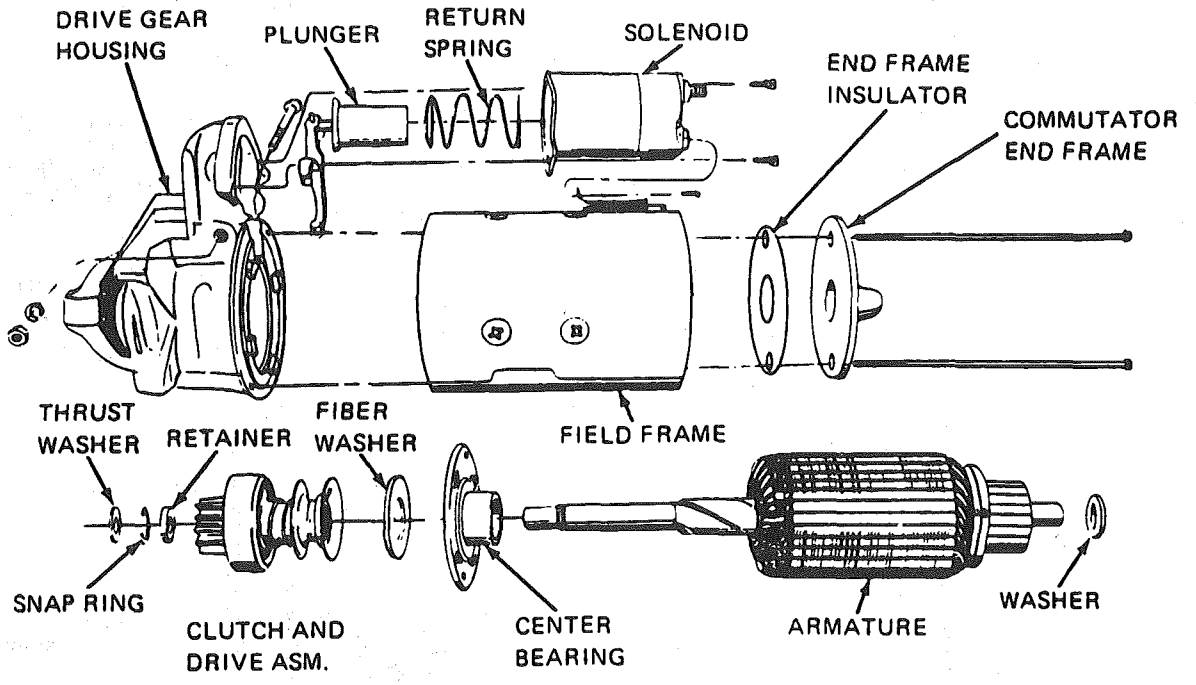
- High internal resistance due to poor connections, defective leads, dirty commutator and causes listed under Number 4.

6. High free speed and high current draw usually indicate shorted fields. If shorted fields are suspected, replace the field coil assembly. Also check for shorted armature, using a growler.

520042-6D

Fig. 603 Starter Motor Disassembly, Test and Reassembly 1 of 6

STARTER DISASSEMBLY

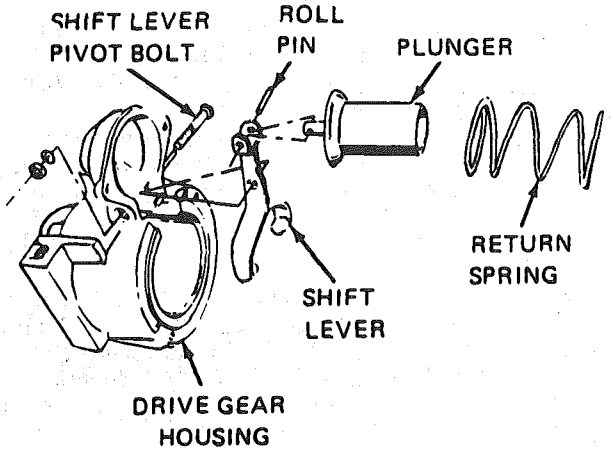


7. Remove screw from field coil connector and solenoid mounting screws. Rotate solenoid 90° and remove along with plunger return spring. Solenoid may now be serviced without further starter disassembly at this time.

8. Remove 2 through bolt, then remove commutator end frame (diesel only, remove insulator) and washer.

9. Remove field frame assembly from drive gear housing. (On diesel starter, armature remains in drive end frame.)

SHIFT LEVER AND PLUNGER REMOVAL

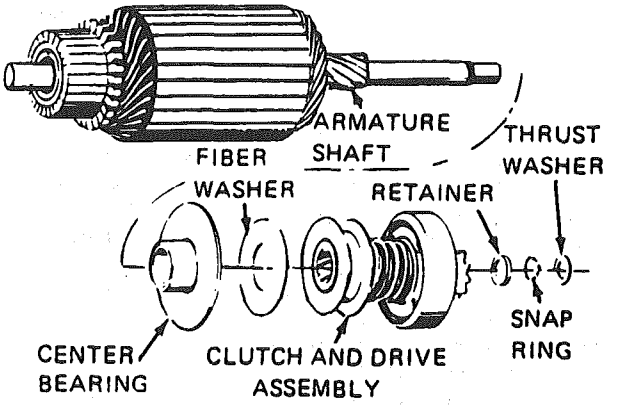


Steps 10 and 11 are required only on diesel starters.

10. Remove shift lever pivot bolt.

11. Remove drive gear housing from armature shaft. Shift lever and plunger assembly will now fall away from starter clutch.

REMOVE DRIVE ASSEMBLY FROM SHAFT



12. If necessary to remove overrunning clutch from armature shaft, proceed as follows:

a. Remove thrust washer or collar from armature shaft.

b. Slide a 5/8" deep socket or piece of pipe of suitable size over shaft against retainer as a driving tool. Tap tool to move retainer off snap ring.

c. Remove snap ring from groove in shaft. If snap ring is distorted, it will be necessary to use a new one on reassembly.

d. Remove retainer, clutch assembly (also fiber washer and center bearing on diesel) from armature shaft.

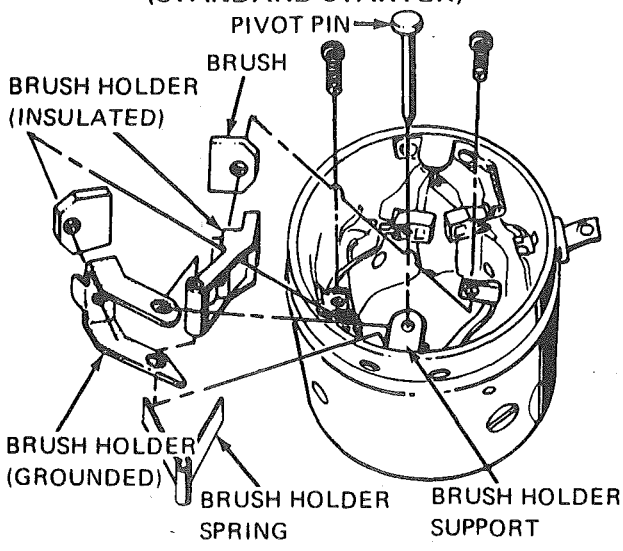
13. The shift lever and plunger may be disassembled at this time by removing the roll pin.

520043-6D

Fig. 604 Starter Motor Disassembly, Test and Reassembly 2 of 6

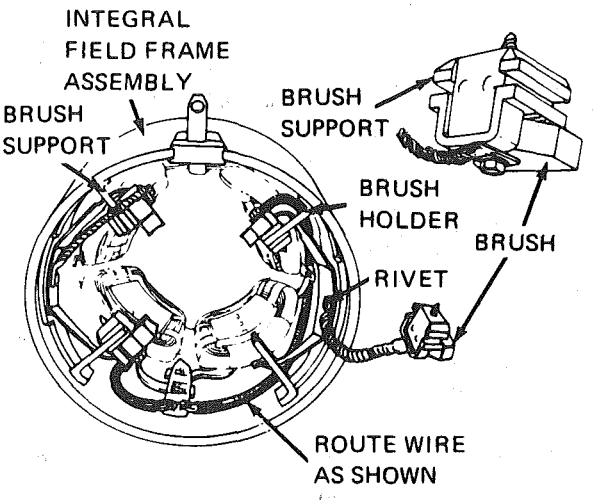
REPLACE BRUSH HOLDER

(STANDARD STARTER)



14. If necessary to replace brush holder parts, proceed as follows:
    a. Remove brush holder pivot pin which positions one insulated and one grounded brush.
    b. Remove brush spring.
    c. Replace brushes as necessary.

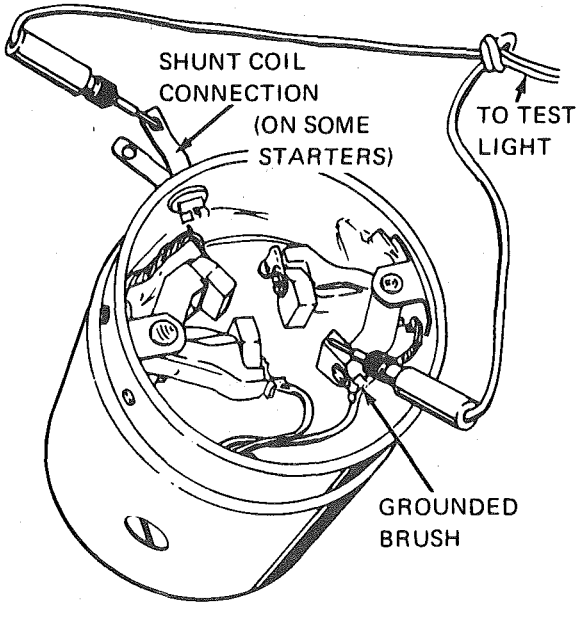
(SMALL 5MT STARTER)



    a. Remove brush holder from brush support.
    b. Remove screw from brush holder and separate brush and holder.
    c. Inspect brush holder for wear or damage.
    d. Replace brushes and/or holders as necessary.

CLEANING INSPECTION AND TESTS

TESTING SHUNT COIL FOR OPEN



15. Clean all starting motor parts, but DO NOT USE GREASE DISSOLVING SOLVENTS FOR CLEANING THE OVERRUNNING CLUTCH, ARMATURE, AND FIELD COILS, solvent would dissolve the grease packed in the clutch and would damage armature and field coil insulation.

16. Inspect armature commutator, shaft and bushings, overrunning clutch pinion, brushes and springs for discoloration, damage or wear. Replace as required.

17. Check fit of armature shaft in bushing in drive housing. Shaft should fit snugly in the bushing. If the bushing is worn, it should be replaced.

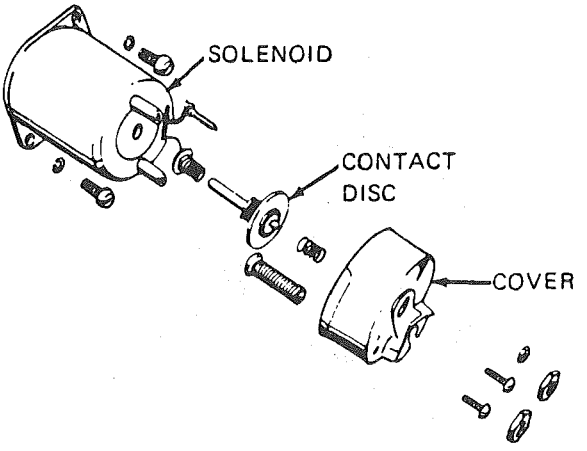
18. Inspect armature commutator. If commutator is rough, it should be turned down. Do not undercut or turn to less than 1.650" O.D. Do not turn out-of-round commutators. Inspect the points where the armature conductors join the commutator bars to make sure they have a good connection. A burned commutator bar is usually evidence of a poor connection.

19. If test equipment is available:
    a. Check the armature for short circuits by placing on growler and holding hack saw blade over armature core while armature is rotated. If saw blade vibrates, armature is shorted. Recheck after cleaning between the commutator bars. If saw blade still vibrates, replace the armature.
    b. Using a test lamp, place one lead on the shunt coil terminal and connect the other lead to a ground brush. This test should be made from both ground brushes to insure continuity through both brushes and leads. If the lamp fails to light, the field coil is open and will require replacement.

520044-6D

Fig. 605 Starter Motor Disassembly, Test and Reassembly 3 of 6

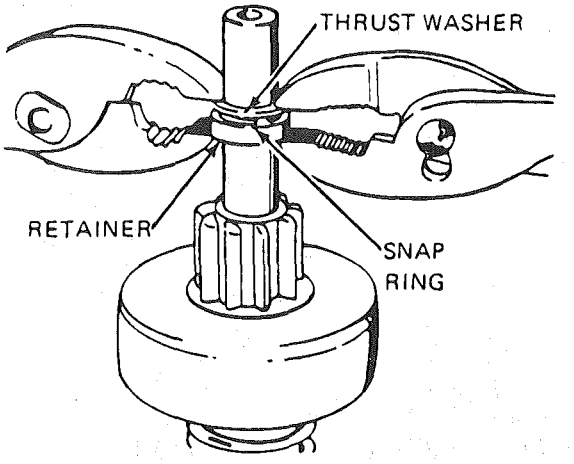
SOLENOID SWITCH DISASSEMBLY



f. The starter solenoid switch is serviced as an assembly. The cover can be removed to inspect the contacts and contact disc if necessary.

STARTER ASSEMBLY

INSTALLING RETAINER, WASHER AND RING



20. Assemble the armature and clutch as follows:
a. Lubricate drive end of armature shaft with lubricant 1960954 or equivalent.
b. Install center bearing (diesel starters) with bearing toward the armature winding. Then install the fiber washer on the armature shaft.
c. Slide clutch assembly onto armature shaft with pinion away from armature.
d. Slide retainer onto shaft with cupped side facing the end of shaft.
e. Install snap ring into groove on armature shaft.
f. Install thrust washer on shaft.
g. Position retainer and thrust washer with snap ring in between. Using two pliers, grip retainer and thrust washer or collar and squeeze until snap ring is forced into retainer and is held securely in groove in armature shaft.

21. Lubricate drive gear housing bushing with lubricant 1960954 or equivalent.

22. Engage shift lever yoke with clutch and slide complete assembly into drive gear housing.
On non-diesel starters the shift lever may be installed in drive gear housing first.

23. Install the shift lever pivot bolt. Tighten securely.

24. Install solenoid assembly.

25. Apply sealer, No. 1050026 or equivalent to solenoid flange where field frame contacts it.

26. Position field frame against drive gear housing on alignment pin using care to prevent damage to brushes.

27. Lubricate commutator end-frame bushing with lubricant 1960954 or equivalent.

28. Install washer on armature shaft and slide end frame onto shaft, then install and tighten through-bolts. On diesel starter, install insulator and then end frame onto shaft. Then install through bolts, making sure they pass through bolt holes in insulator.

29. Connect the field coil connector to the solenoid terminal.

30. Check pinion clearance as outlined under PINION CLEARANCE.

520046-6D

Fig. 607 Starter Motor Disassembly, Test and Reassembly 5 of 6