STARTING SYSTEM

STARTING SYSTEM CIRCUIT

Fig. 7-1

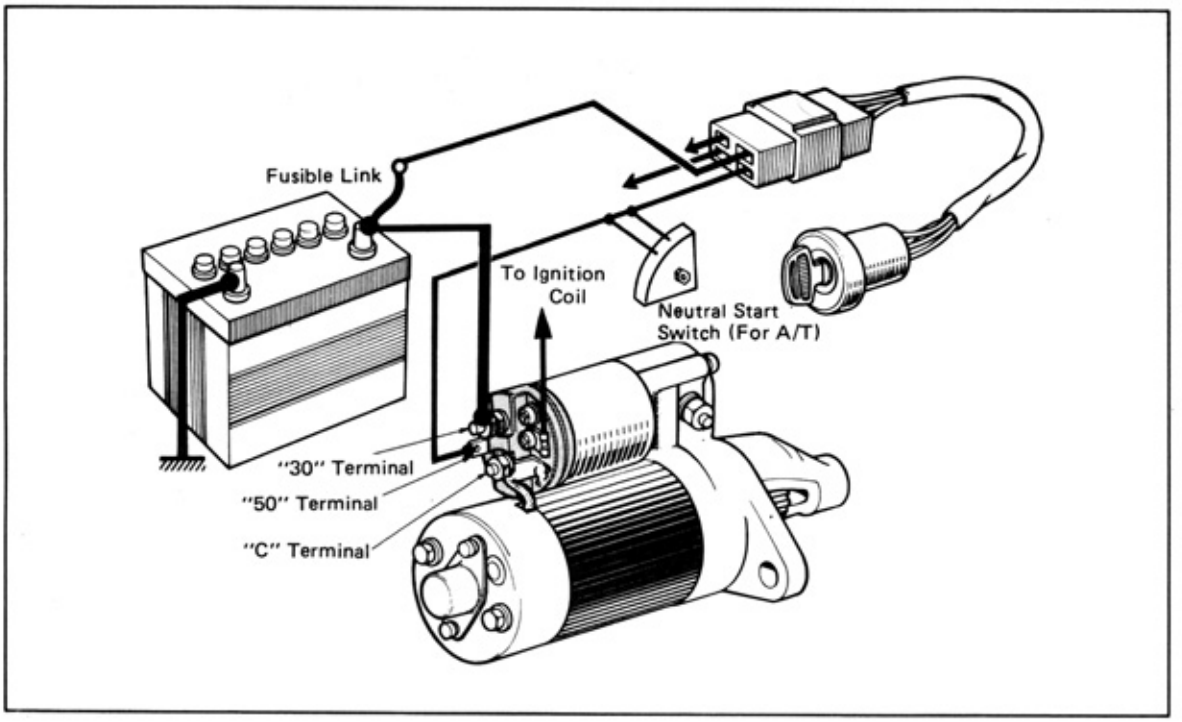
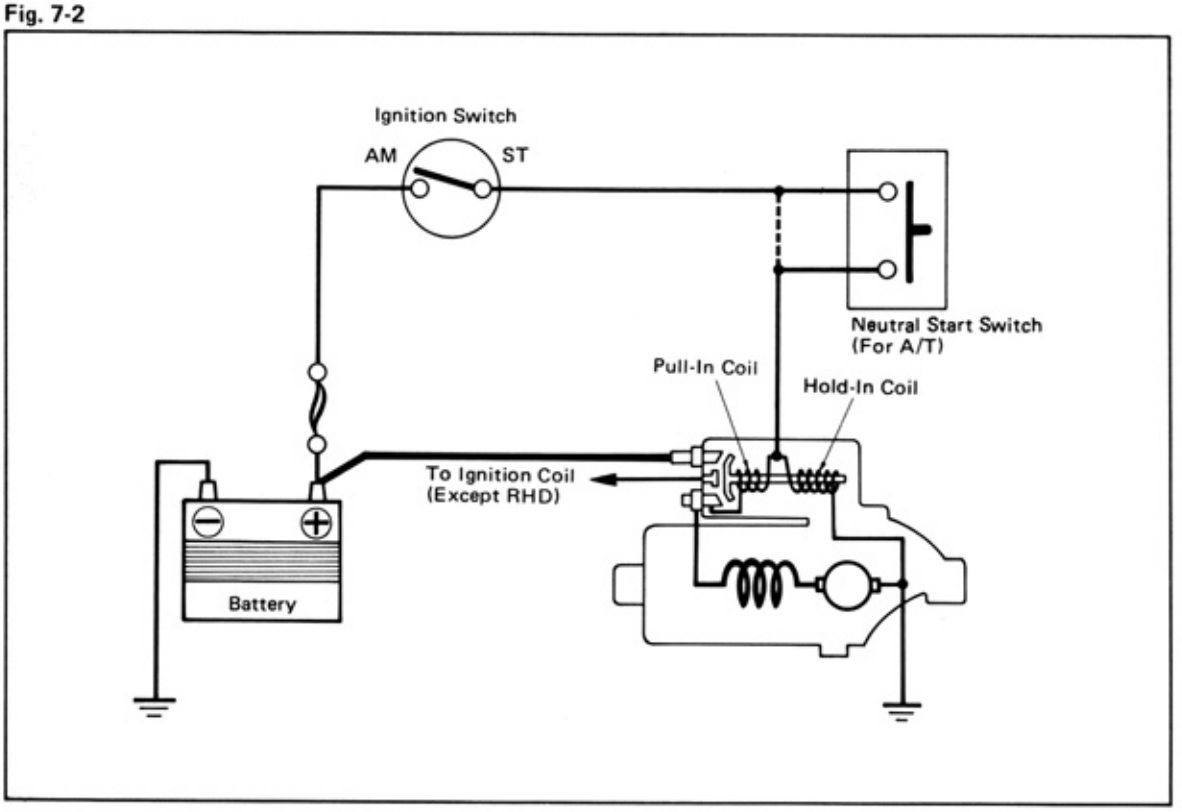
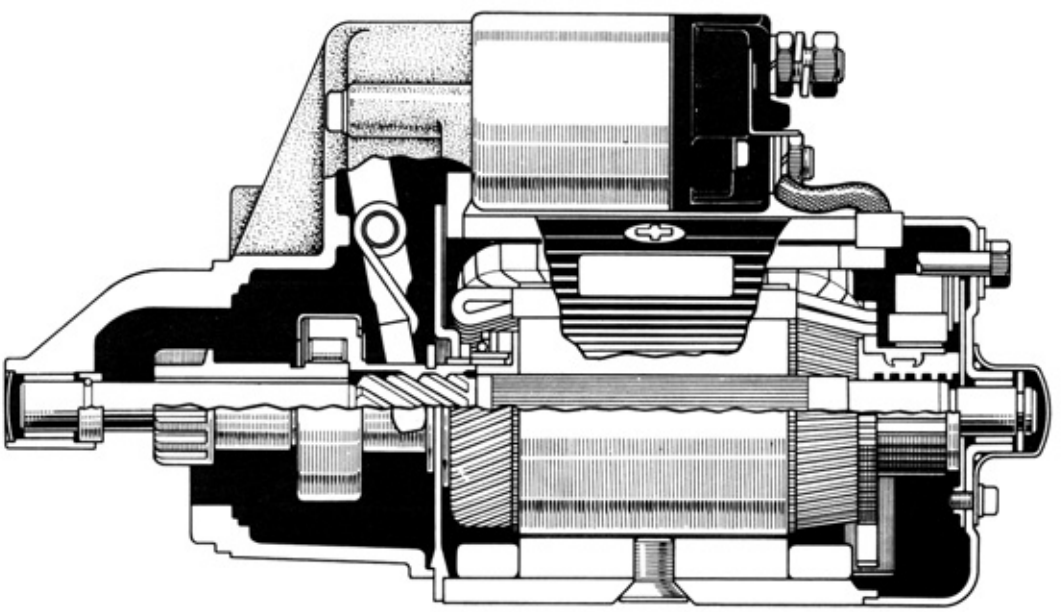


Fig. 7-2



STARTER

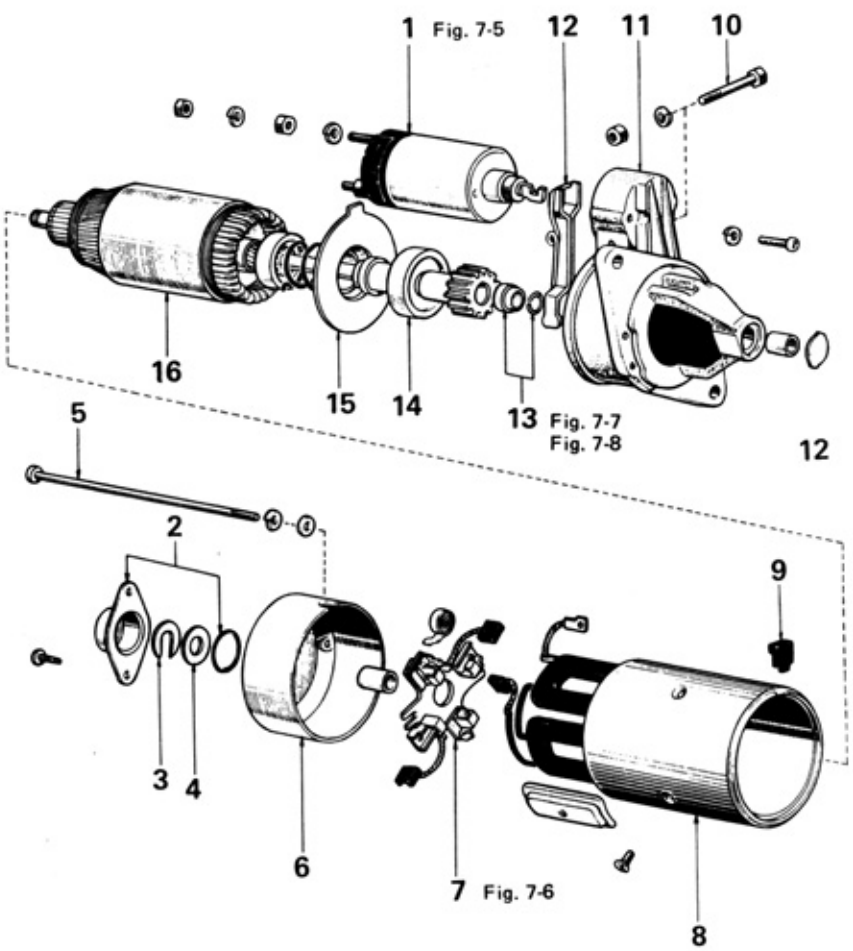
Fig. 7-3



DISASSEMBLY

Disassemble in numerical order.

Fig. 7-4

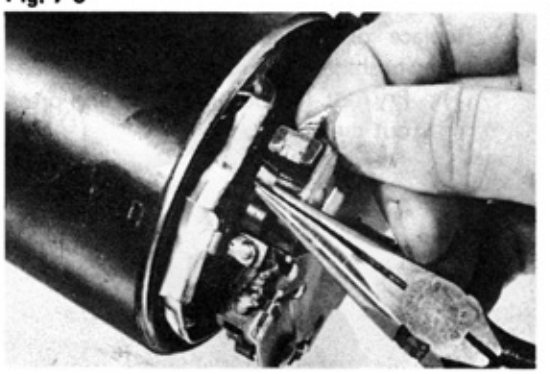


1	Magnetic Switch	9	Rubber Plate
2	End Frame Cap & O Ring	10	Bolt
3	Lock Plate	11	Drive Housing
4	Shim	12	Drive Lever
5	Bolts	13	Collar & Snap Ring
6	Commutator End Frame	14	Clutch Assembly
7	Brush Holder & Brush Spring	15	Center Bearing
8	Field Frame	16	Armature

Fig. 7-5

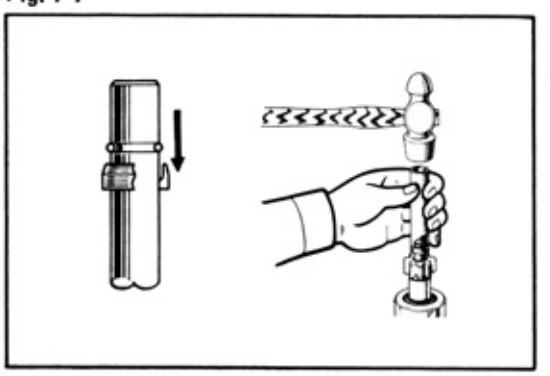
1. Loosen two screws.
2. Unhook the moving stucl from the drive lever by tilting the switch end in arrow direction and pull out the magnetic switch.

Fig. 7-6



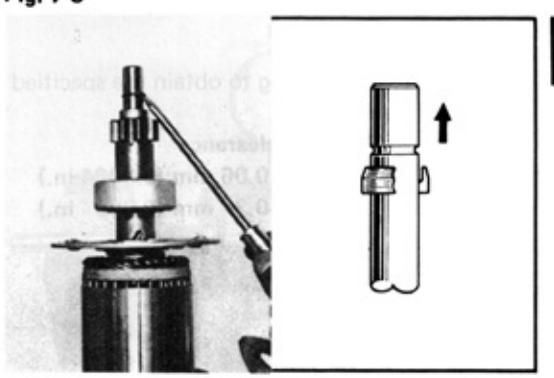
1. Take off the brushes from brush holder.
2. Pull out the brush holder from the armature shaft.

Fig. 7-7



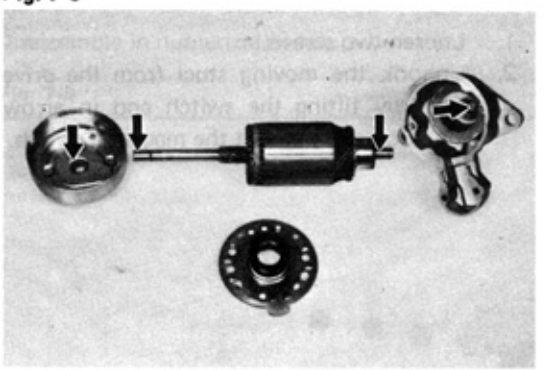
1. Tap in stop collar, using a screwdriver or others.

Fig. 7-8



2. Pry off the snap ring, using a screwdriver.
3. Remove collar from shaft.

Fig. 7-9



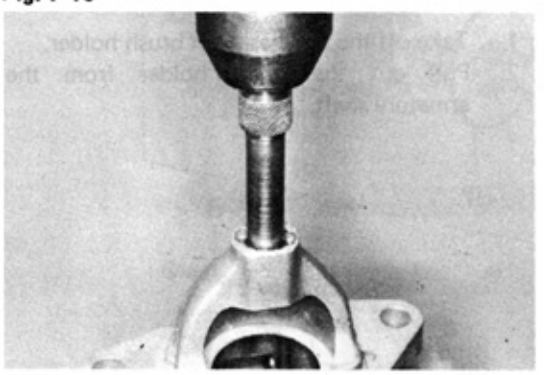
INSPECTION & REPAIR

Armature Shaft & Bearing

1. Inspect armature shaft, drive housing bushing and end frame bushing for wear or damage.

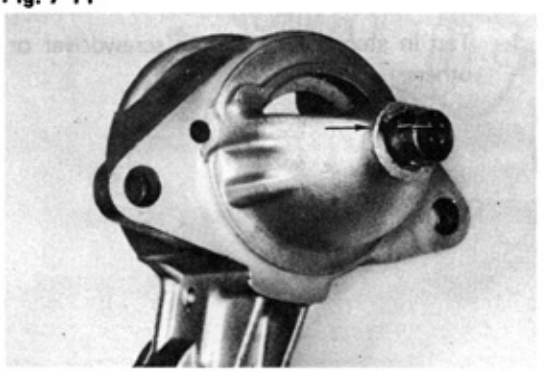
Oil clearance limit 0.2 mm (0.008 in.)

Fig. 7-10



2. Replace drive housing bushing and end frame bushing if any contact suspect.
   (1) Pry out the bushing cover and press out the bushing.

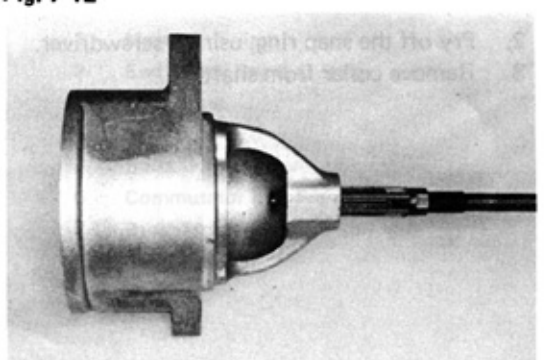
Fig. 7-11



(2) Alining the bushing hole with the housing groove, press in new bushing.

Bushing Bore (After insertion in frame)	
STD	12.475 to 12.502 mm (0.4912 to 0.4922 in.)
U/S 0.30	12.175 to 12.202 mm (0.4794 to 0.4804 in.)
U/S 0.50	11.975 to 12.002 mm (0.4715 to 0.4725 in.)

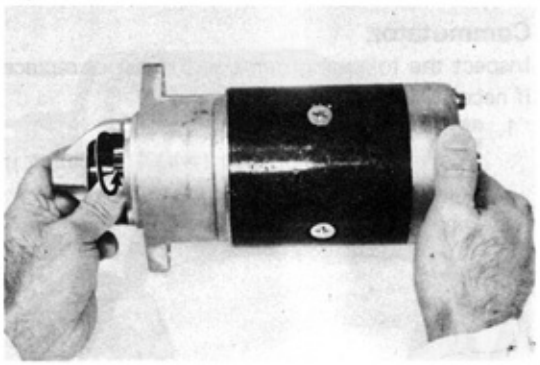
Fig. 7-12



(3) Ream bushing to obtain the specified clearance.

Standard clearance
0.06 mm (0.0024 in.)
Limit 0.2 mm (0.008 in.)

Fig. 7-13

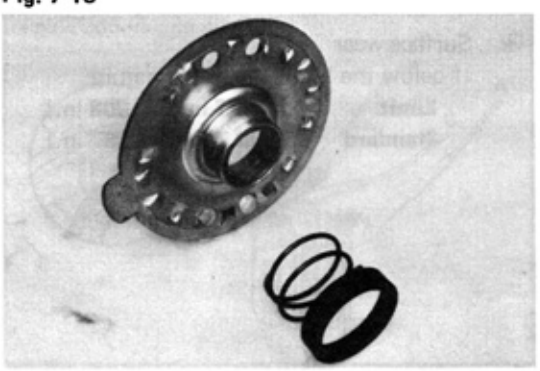


(4) Temporarily assemble the parts.
(5) Make sure of armature shaft rotates smoothly.

Fig. 7-14

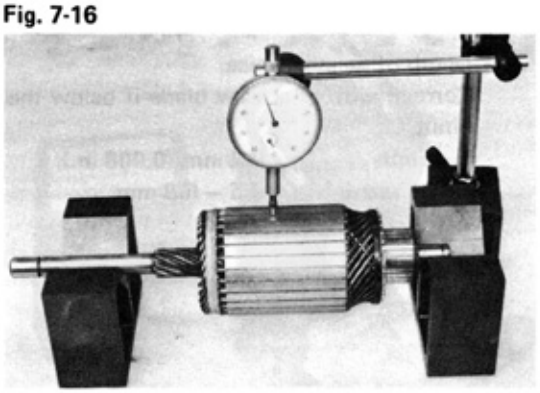
(6) Clean the bore, and install new bushing cover and stake the housing at four positions.

Fig. 7-15



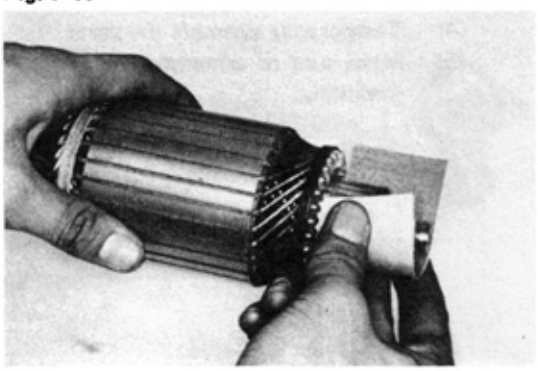
3. Inspect spring holder, spring and center bearing for cracks, wear or damages. Replace if necessary.

Fig. 7-16



4. Inspect armature for runout.
5. Inspect shaft spline for wear.

Fig. 7-17

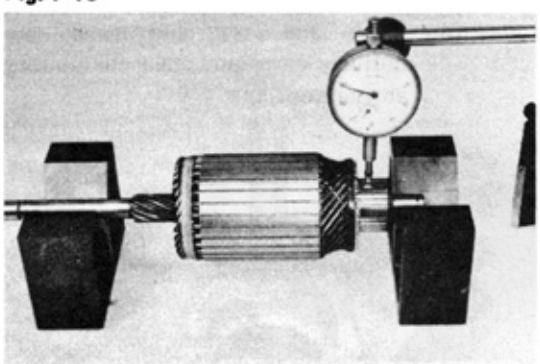


Commutator

Inspect the following items and repair or replace if necessary.

1. Dirty or burnt surface.
   Correct by sandpaper (#400) or lathe if necessary.

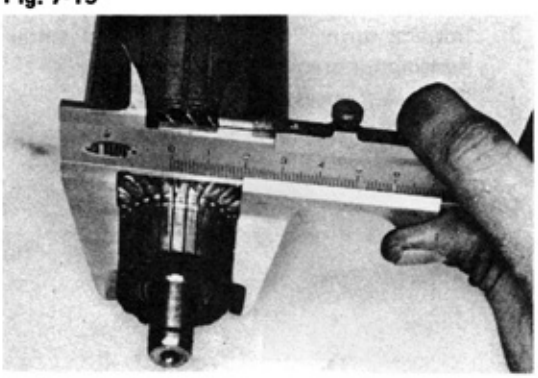
Fig. 7-18



2. Runout
   Correct on lathe if exceeds the limit.

Runout limit	**0.3 mm (0.012 in.)**
Standard	**0.01 mm (0.0004 in.)**

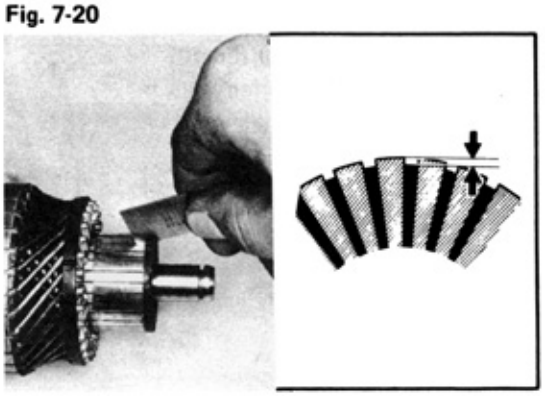
Fig. 7-19



3. Surface wear
   If below the limit, replace armature.

Limit	**30.7 mm (1.208 in.)**
Standard	**32.7 mm (1.287 in.)**

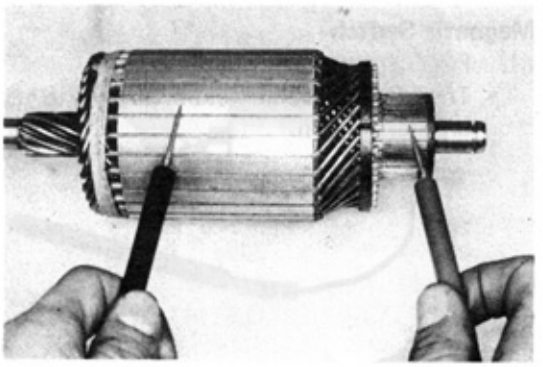
Fig. 7-20



4. Depth of segment mica
   Correct with a hacksaw blade if below the limit.

Limit	**0.2 mm (0.008 in.)**
Standard	**0.5 – 0.8 mm (0.020 to 0.31 in.)**

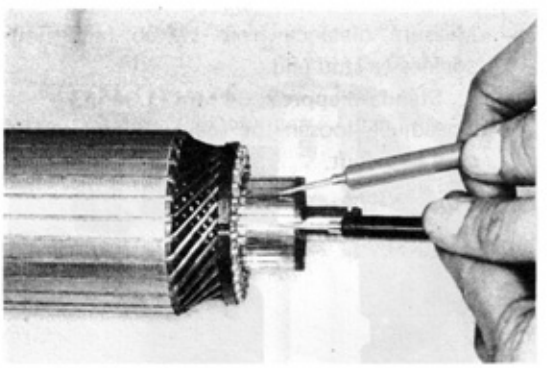
Fig. 7-21



Armature Coil

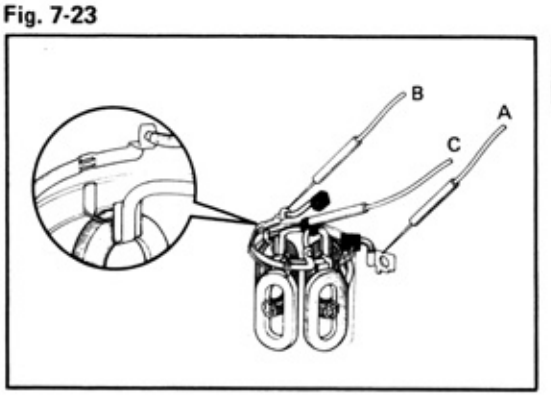
1. Ground test
   Using a circuit tester, check commutator and armature coil core.
   If there is contunuity, the armature is grounded and must be replaced.

Fig. 7-22



2. Open-circuit test
   Check for continuity between the segments.
   If there is no continuity at any test point, there is an open-circuit and armature must be replaced.

Fig. 7-23



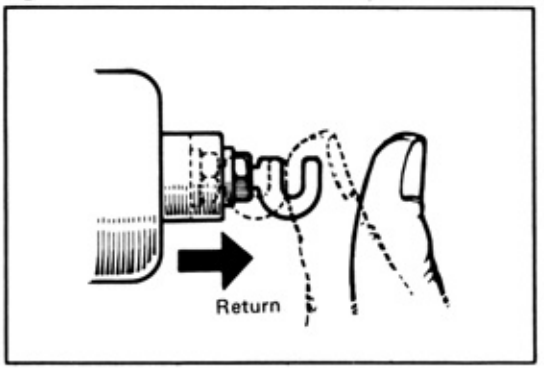
Field Coil

1. Open-circuit test
   Unsolder the connection shown by arrow, and check for continuity between A and B, and between A and C. If there is no continuity, the field coil has an open-circuit and should be replaced.

Fig. 7-24

2. Ground test
   Check for continuity between field coil end and field frame.
   If there is continuity, repair or replace the field coil.

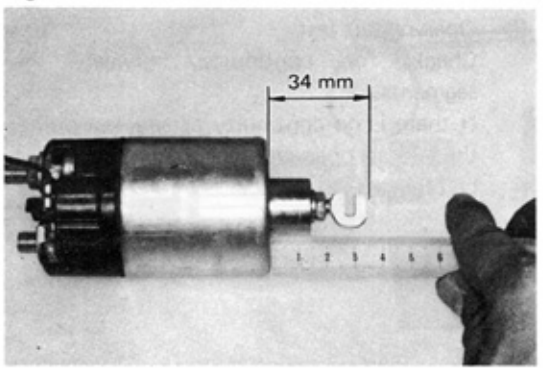
Fig. 7-25



Magnetic Switch

1. Push in plunger and release it.
   The plunger should return quickly to its original position.

Fig. 7-26

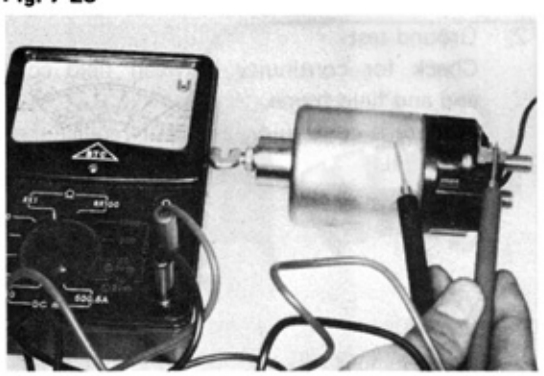


2. Measure distance from switch mounting surface to stud end.
   Standard approx. 34 mm (1.34 in.)
   To adjust, loosen the lock nut and screw stud in or out.

Fig. 7-27

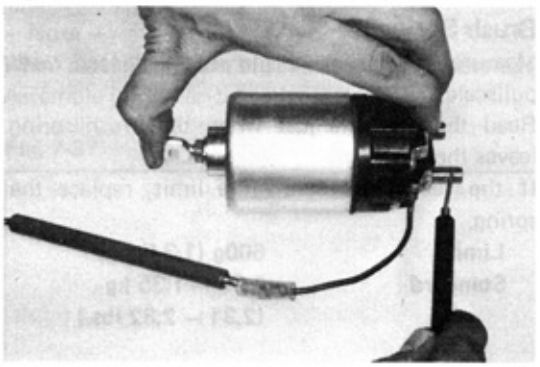
3. Pull-in coil open circuit test
   Check for continuity between the "50" terminal and "C" terminal.

Fig. 7-28



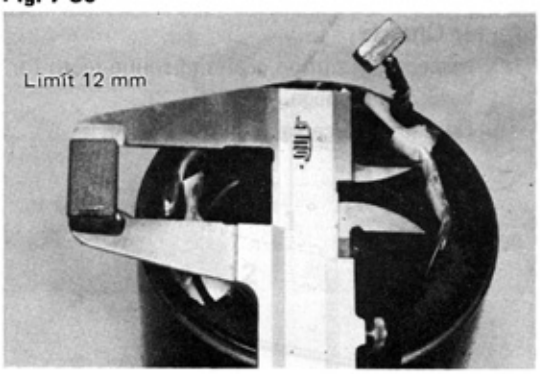
4. Hold-in coil open circuit test
   Check for continuity between "50" terminal and switch body.

Fig. 7-29



5. I.G. terminal continuity test.
Push in until it stops. Check for continuity between "30" terminal and lead wire.

Fig. 7-30

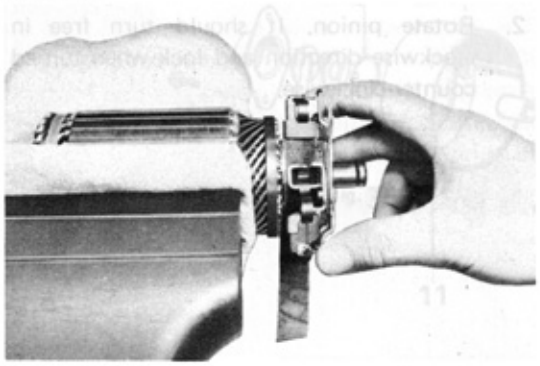


Brushes

1. Measure the brush length and replace if below the limit.

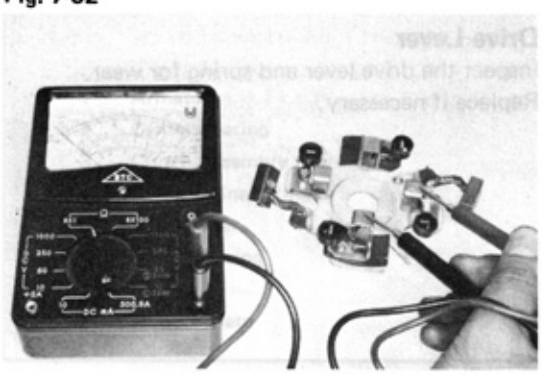
Limit	**12 mm (0.47 in.)**
Standard	**19 mm (0.75 in.)**

Fig. 7-31



2. If brush is replaced, dress it with emery cloth to provide proper contact.

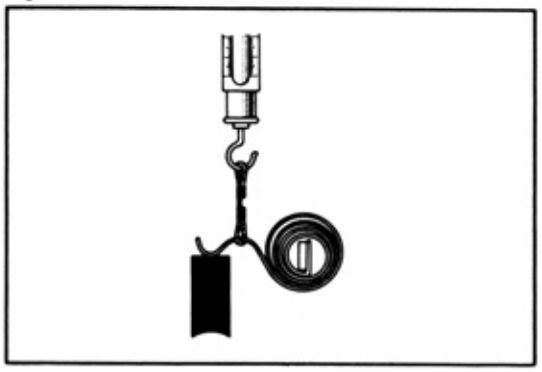
Fig. 7-32



Brush Holder

Check insulation between the (+) and (–) brush holders.
Repair or replace if continuity is indicated.

Fig. 7-33



Brush Spring

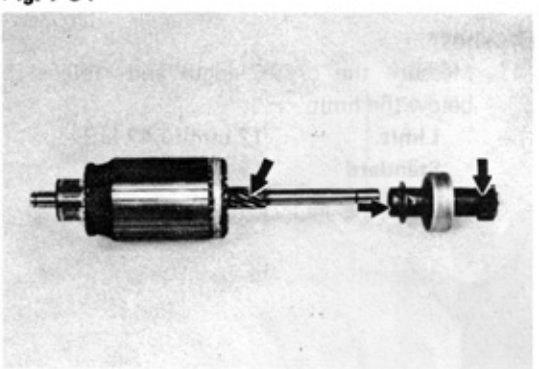
Measure the brush spring installed load with pullscale.

Read the pullscale just when the brush spring leaves the brush.

If the reading is below the limit, replace the spring.

Limit	**600g (1.3 lbs.)**
Standard	**1.05 – 1.35 kg (2.31 – 2.32 lbs.)**

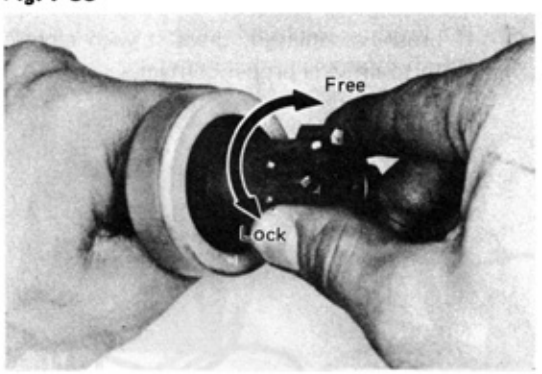
Fig. 7-34



Starter Clutch

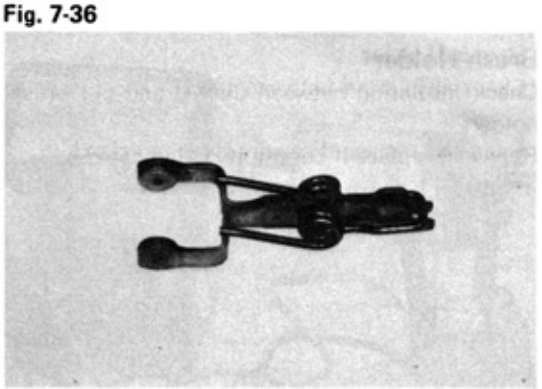
1. Inspect the pinion gear and spline teeth for wear and damage.
   Replace if necessary.

Fig. 7-35



2. Rotate pinion. It should turn free in clockwise direction and lock when turned counter-clockwise.

Fig. 7-36



Drive Lever

Inspect the drive lever and spring for wear.
Replace if necessary.

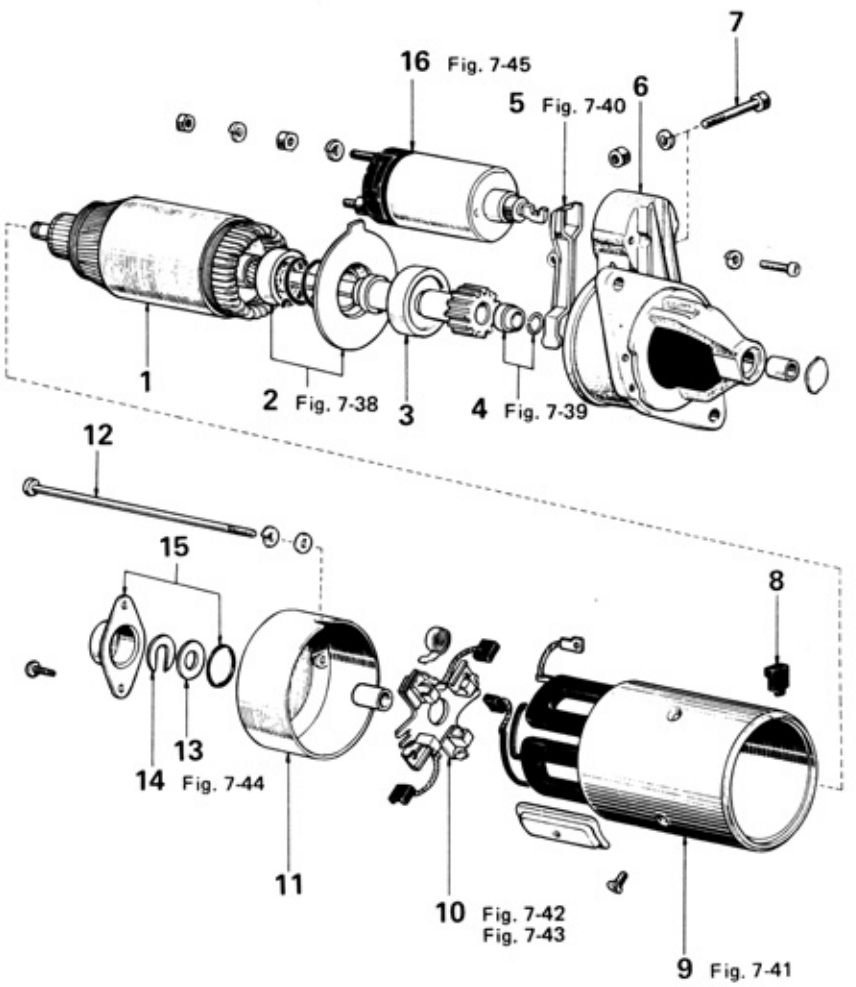
ASSEMBLY

– Note –

When assembling, use high temperature grease to lubricate bearings and sliding parts.

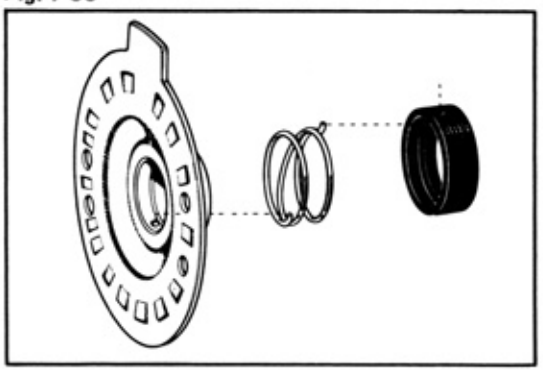
Assemble in numerical order.

Fig. 7-37



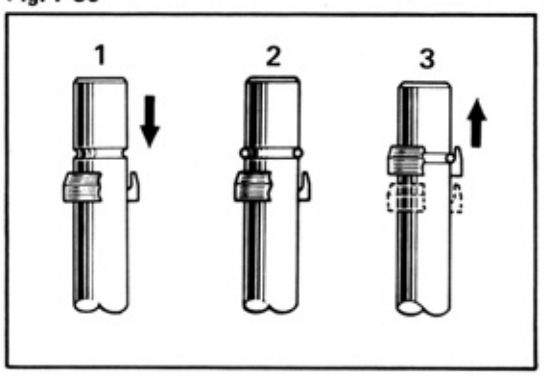
1	Armature	9	Field Frame Assembly
2	Center Bearing	10	Brush Holder & Brush Spring
3	Clutch Assembly	11	Commutator End Frame
4	Collar & Snap Ring	12	Bolts
5	Drive Lever	13	Shim
6	Drive Housing	14	Lock Plate
7	Bolt	15	End Frame Cap & O Ring
8	Rubber Plate	16	Magnetic Switch

Fig. 7-38



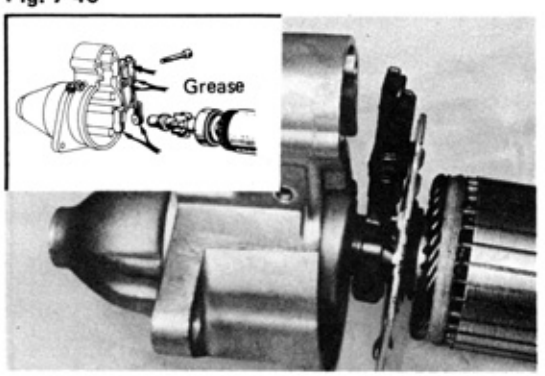
Insert the spring end that is bent inward bearing hole, and the spring end that is bent outward into the spring holder.

Fig. 7-39



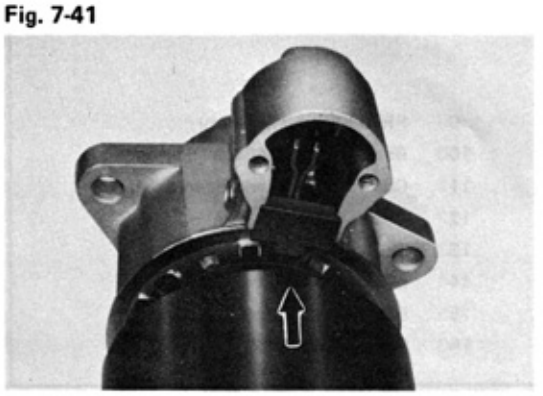
1. Insert new stop collor over the armature shaft.
2. Install the new snap ring.
3. Secure stop collar.

Fig. 7-40



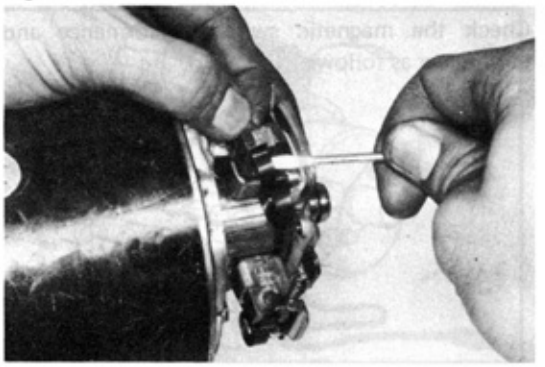
The drive lever must be installed in the position illustrated.
Assemble the armature into the drive housing, and insert the drive lever pivot bolt through the lever hole and screw on the nut.

Fig. 7-41



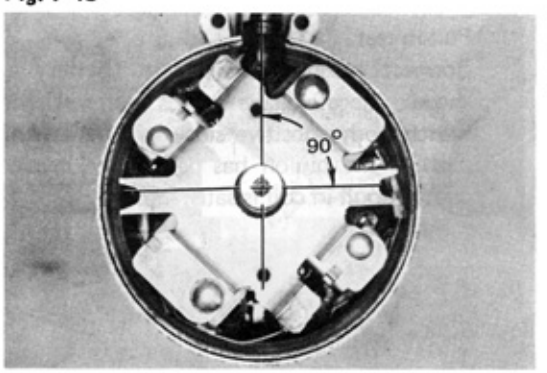
Match notch in field frame with tab on rubber plate and assemble field frame with drive housing.

Fig. 7-42



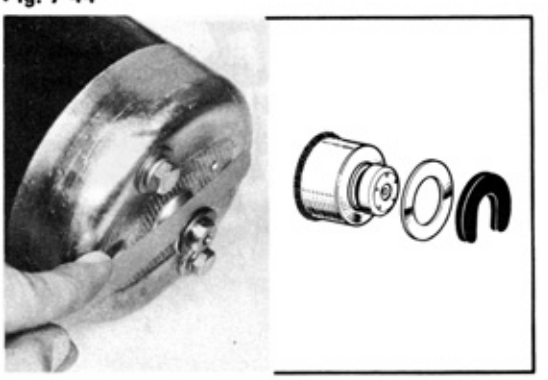
Install brush holder, and fit the four brushes into brush holder, checking that the (+) lead wires are not grounded.

Fig. 7-43



After installation, position the holder as shown.

Fig. 7-44

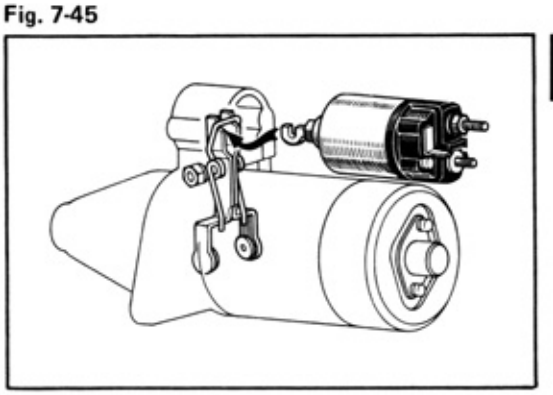


Install the lock plate and measure the armature shaft thrust clearance, If clearance exceeds the specified value, correct by increasing the number of shims.

Thrust clearance

Standard	**0.01 to 0.35 mm (0.0004 to 0.014 in.)**
Limit	**0.8 mm (0.032 in.)**

Fig. 7-45



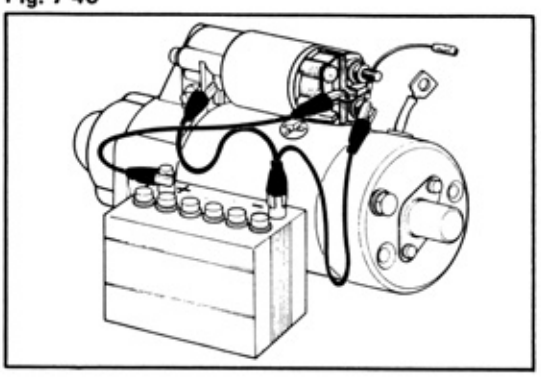
Hook the magnetic switch joint on the drive lever spring from the lower side.
Rotate to position smaller terminal next to field frame and install magnetic switch bolts.

– Precaution –
These tests must be performed in short time (3-5 seconds) to prevent the coil from burning. Disconnect the field coil lead from "C" terminal.

PERFORMANCE TEST

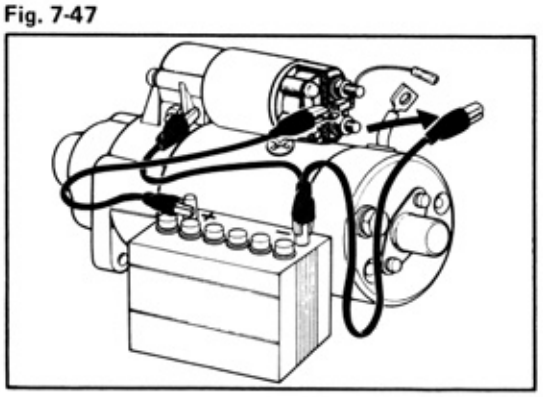
Check the magnetic switch performance and pinion gap as follows:

Fig. 7-46



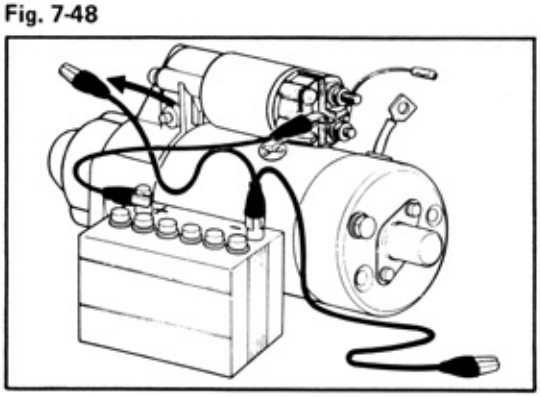
1. Pull-in test
   Connect magnetic switch to battery as shown. (negative side to "C" terminal and switch body; positive side to "50" terminal). If the pinion has definitely jumped out, the pull-in coil is satisfactory.

Fig. 7-47



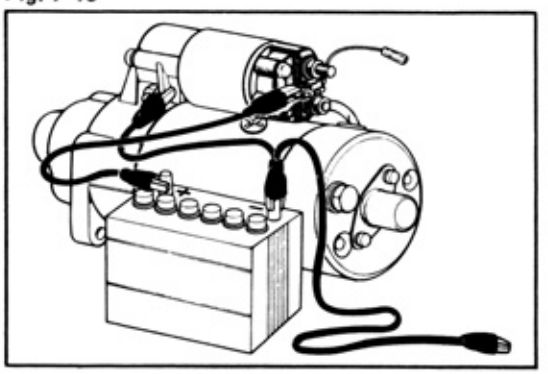
2. Hold-in test
   Next disconnect the "C" terminal.
   The pinion should remain in jumped-out condition.

Fig. 7-48



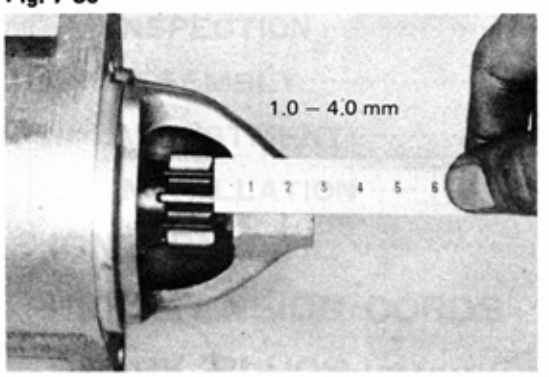
3. Check the plunger return.
   When disconnecting the switch body, the pinion should return quickly.

Fig. 7-49



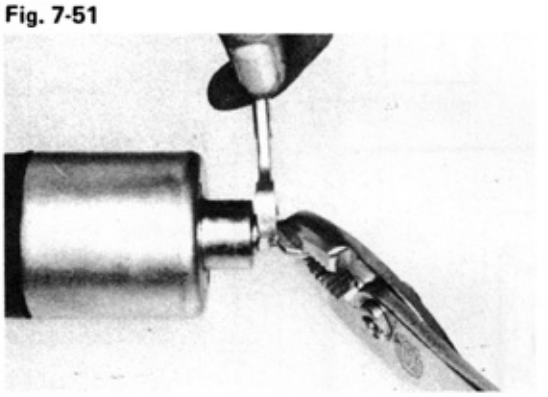
4. Check the pinion clearance.
   (1) Connect the magnetic switch to battery as shown.
   Field coil lead to "C" terminal
   Battery negative side to body
   Battery positive side to 50 terminal

Fig. 7-50



   (2) Move the pinion to armature side to eliminate the slack, and check the clearance between the pinion end and stop collar.
   Standard clearance
   1.0 – 4.0 mm
   (0.04 – 0.16 in)

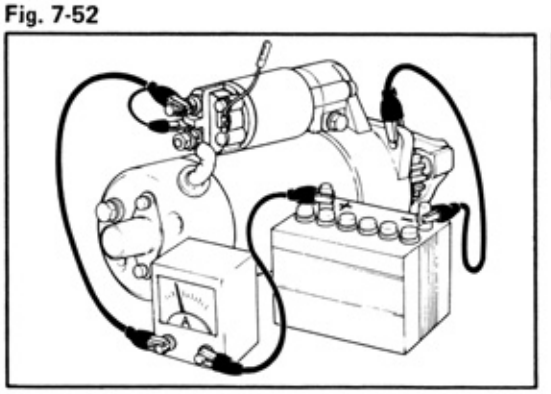
Fig. 7-51



   (3) Adjust if necessary after loosening lock nut.

Clearance		Stud
Too large	→	Screw in
Too small	→	Screw out

Fig. 7-52



5. No-load performance test
   Connect the field coil lead to the "C" terminal, making sure that the lead wire is not grounded.
   Connect starter to battery. If the starter shows smooth and steady rotation with the pinion jumping out and draws less than specified current, it is satisfactory.
   Specified current
   Less than 50A

MEMO