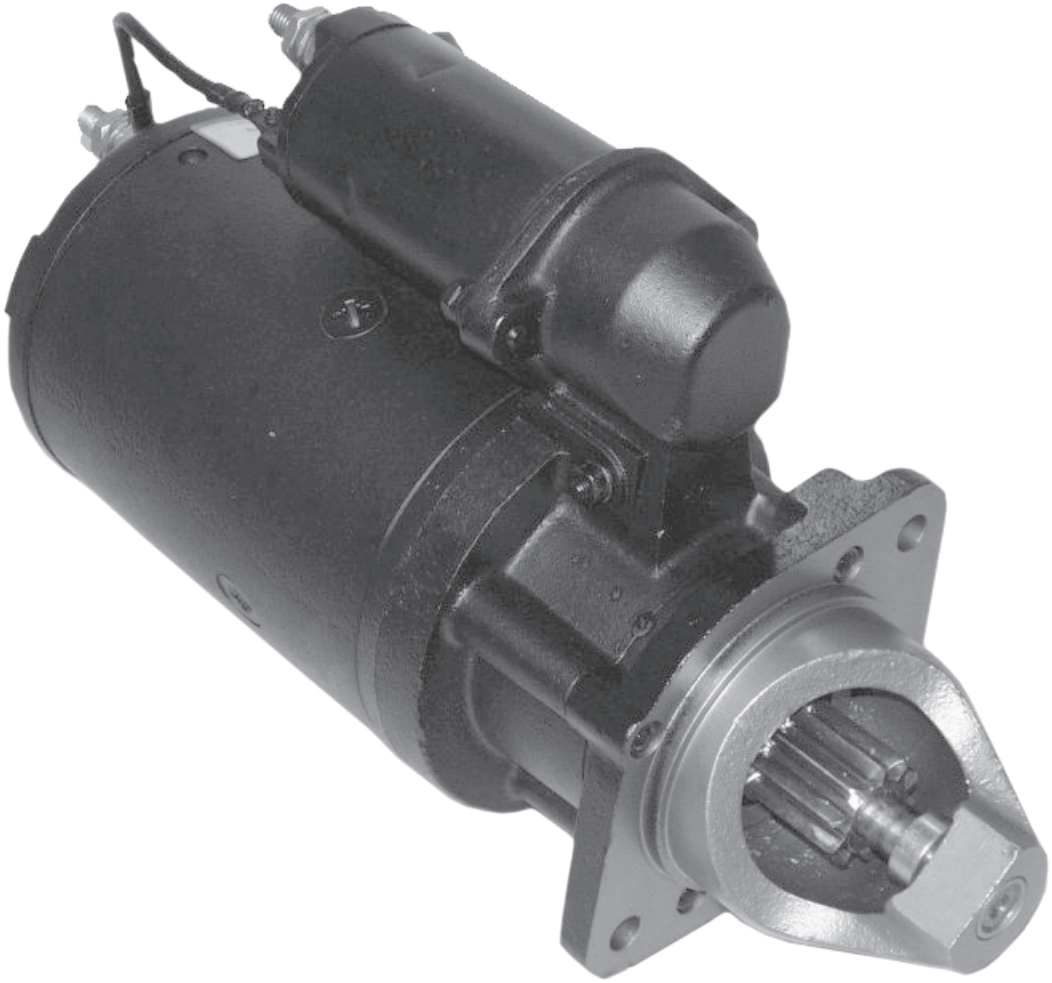
Service Manual for the LNS Series Starter Motor



Troubleshooting, Diagnostics and Repair

Prestolite electric

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LNS4524 STARTER MOTOR

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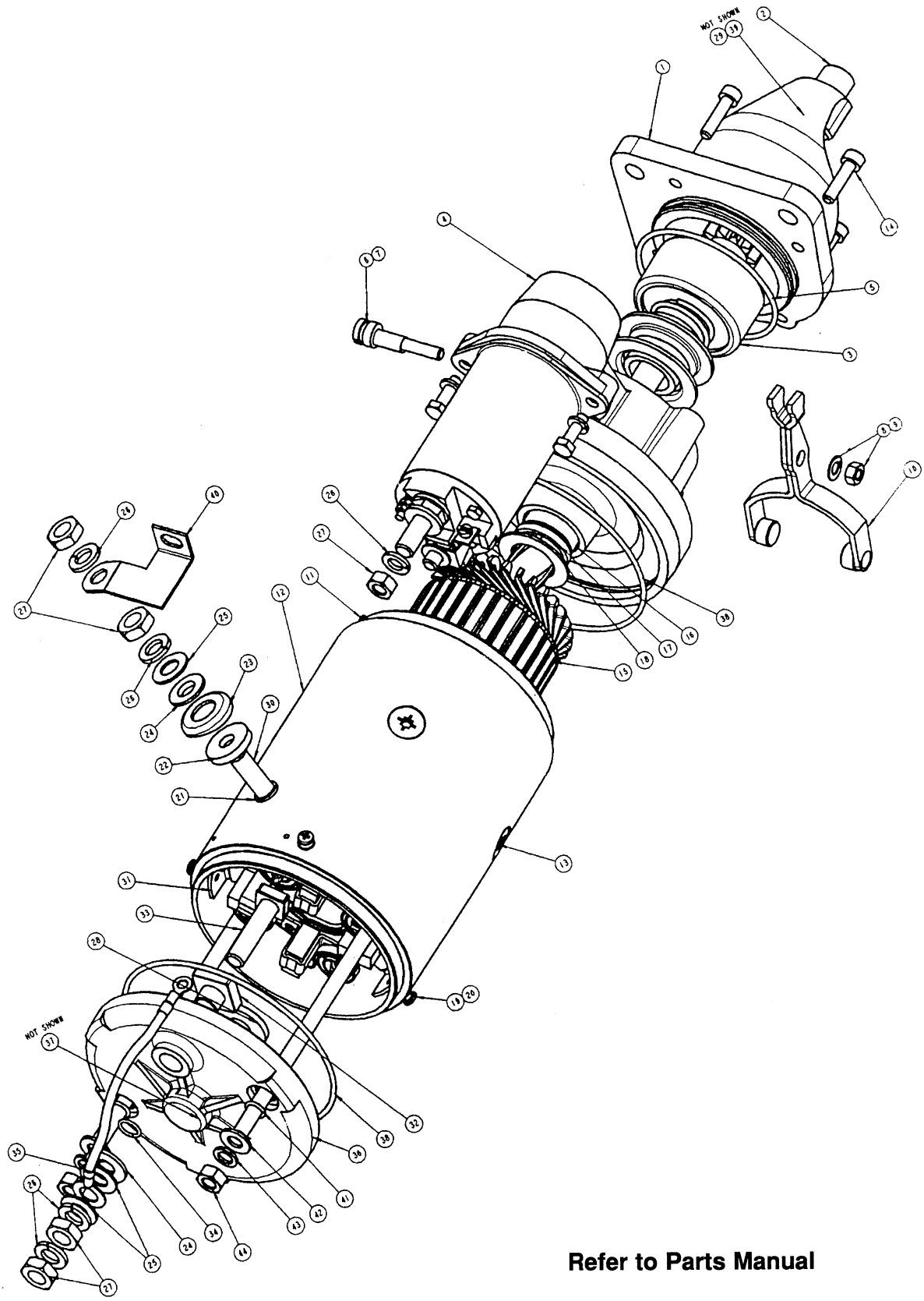
LNS4524 TECHNICAL DATA

Output	**6 HP, 4.5 KW**
Lock Torque	**45Nm, 4.59 KGF M, 33.2 LBF FT**
Min brush length	10mm (0.394in)
Brush spring pressure	2.267-2.551 KGF, 22.24-25.02 N (80-90 OZF)
Min. commutator diameter	41.91mm (1 .650in)
Armature Shaft Bush Bore (Reamed in position):	
Nose housing	14.286-14.310mm (0.56251 -0.5634in)
Commutator end housing	12.700-12.723mm (0.500-0.5009in)
Shift lever housing	25.00-25.021mm (0.9894-0.985in)
Solenoid Resistance:	
Pull-in coil	0.786 ohms @ 20 deg.C (68 deg.F)
Hold-in coil	2.15 ohms @ 20 deg.C (68 deg.F)
Torque Wrench Settings	
Commutator end bolts	1.50 KGF M, 15 Nm (130 LBF IN)
Nose Housing to Shift Housing	1.50 KGF M, 15 Nm (130 LBF IN)
Pole shoe screws	425 LBF IN, 48Nm +/-10 %

LNS4524 Dismantled



Refer to Parts Manual

DISMANTLING MOTOR

The motor is dismantled into five sub assemblies:

(1) Solenoid
(2) Nose Housing
(3) Commutator End Housing
(4) Field Ring Assembly
(5) Armature Assembly

Procedure

(1) Disconnect the jumper lead from the solenoid terminal 4 **(See Fig. 1)** to the negative terminal, making a note of the position of the washers.

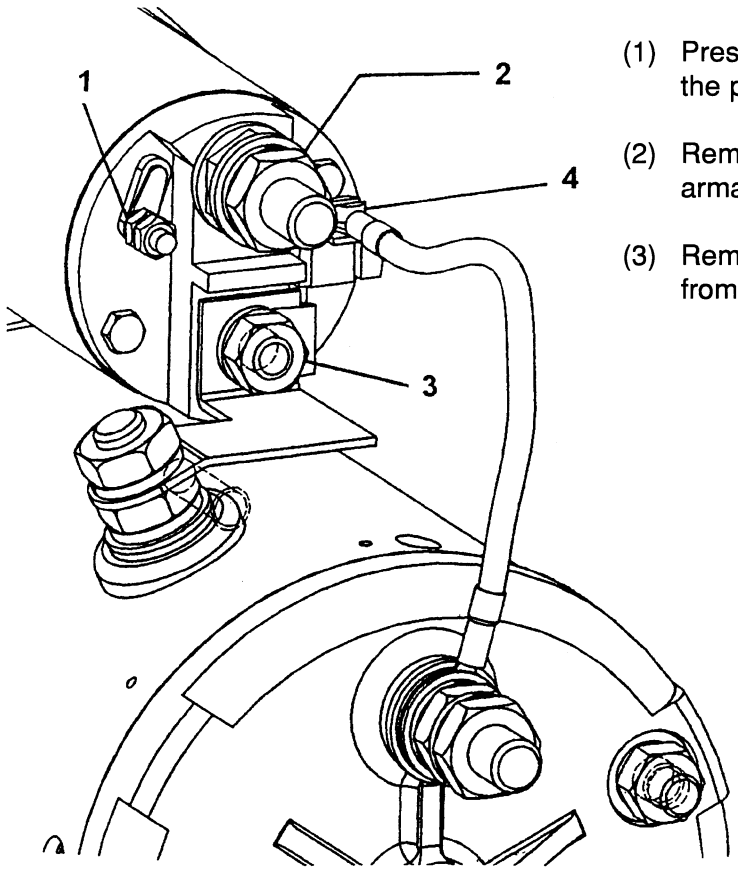


Fig. 1

(2) Disconnect the jumper lead from the solenoid terminal 3 **(See Fig. 1)** to the field terminal connection.

(3) Remove the two bolts holding the solenoid to the shift housing, hence removing the solenoid from the motor.

(4) Remove the four bolts from the nose housing and slide it off the motor.

(5) Remove the through bolts from the commutator end housing.

(6) Lift the four brushes away from the commutator and separate the field ring assembly from the shift housing.

Dismantling of Armature Assembly

(1) Press down the pinion stop towards the pinion.

(2) Remove the snap ring from the armature shaft.

(3) Remove the shift housing and drive from the armature.

INSPECTING AND TESTING COMPONENTS

Solenoid

(1) Check that the resistance between terminals 1 and 3 (pull-in coil) is 0.786 ohms +/-10% at 20 deg. C (68 deg. F).

(2) Check that the resistance between terminals 1 and 4 (hold-in coil) is 2.15 ohms +/-10% at 20 deg. C (68 deg. F).

(3) Check that the coil is not earthed to housing, using Megger set at 250 volts and minimum pass resistance should be no lower than 1 megohm.

(4) If all three tests pass proceed below. If there is failure on one or all three tests the solenoid must be replaced.

Electrical testing of solenoid (See Fig. 2)

(1) Activate the switch to energise the solenoid.

(2) Remove the link between terminals 3 and 4 (pull-in coil) so that the hold-in coil is keeping the solenoid activated and contacts closed.

(3) Using a multimeter set on resistance, attach the leads to terminals 2 and 3. Readings should be no greater than 0.03 ohms.

(4) If the reading is acceptable and the solenoid operates correctly, then the solenoid can be used on the build up of the motor. If not it must be replaced.

(1) 24 volt positive switch

(2) Connect to multimeter

(3) Connect to multimeter Link to terminal 4

(4) 0 volt negative

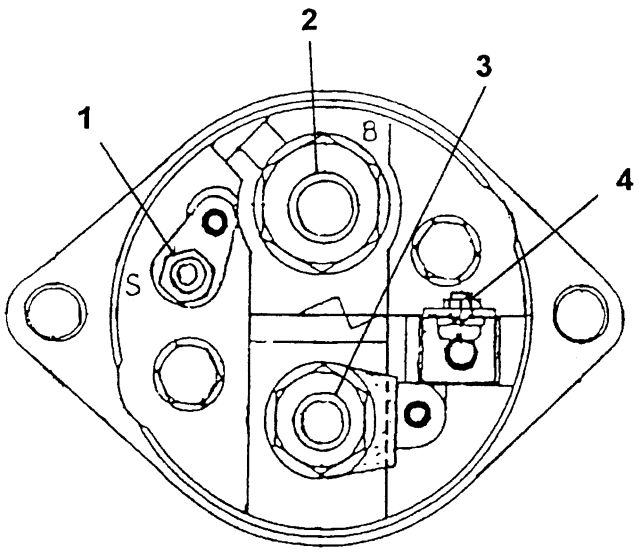


Fig. 2

Commutator End Housing

(1) Check for any damage, cracks or other defects.

(2) If the bush is worn or scored, remove it.

(3) Press in a new bush.

(4) Check that the diameter of the bearing bore is 12.700-12.723mm (0.5000-0.5009in).

Nose Housing

(1) Check for any damage, cracks, distortion or other defects.

(2) If the bush is worn or scored, remove it.

(3) Press in a new bush.

(4) Check that the diameter of the bearing bore 14.286-14.310mm (0.5625-0.5634in).

Field Ring Assembly

(1) Remove positive and negative brushes from brush holders.

(2) Inspect brushes for even wear. If the brush length is less than 10mm replace them.
Note: When replacing brushes use high temperature solder or equivalent.

(3) Remove the brush holder assembly from the field ring and check that brush holders are not damaged and insulated from each other. Check that the brush spring pressure is correct (see data). Replace the brush holder assembly if it does not test correctly.

(4) Inspect the field ring for damage or distortion.

(5) Visually inspect the field coils for signs of corrosion, burning, damage to jumpers etc.

(6) Check for continuity of the field coils (series and shunt) and check for coils earthing to field ring or pole shoes, using Megger set at 250 volts and minimum pass resistance should be greater than 1 megohm.

(7) If all components are satisfactory then rebuild, but if a fault is found on any of the above tests, replace the field ring assembly.

Armature

(1) Inspect the splines and all bearing surfaces for wear or damage.

(2) Check the armature shaft alignment with 'V' blocks or in centres. If the run out exceeds 0.27mm (0.005in), the armature must be replaced.

(3) Inspect the surface of the commutator which should be of an even highly burnished dark copper appearance. If the surface is rough, pitted, scored, burned or coated with hard carbon then, provided that it is otherwise in a good electrical and mechanical condition, it may be skimmed on a suitable lathe. In order not to weaken the commutator or have to much clearance between the brush holders and the commutator, giving unstable brushes and weakening.

the spring pressure unduly, the commutator diameter must never be less than 41.91mm (1.650in).

Note: Under no circumstances must the commutator be undercut.

(4) Check the armature for earth leakage between the armature core and each commutator segment.

(5) Check the armature for short circuits with a growler or similar equipment.

(6) Check the armature for continuity.

Shift Lever Housing

(1) Remove the pivot bolt and inspect for wear. Replace if faulty.

(2) Inspect the lever arm for distortion wear or damage. If cams are worn replace lever arm.

(3) Check for damage, cracks or other defects to shift housing.

(4) If bush is worn or scored, remove bush and oil seal. Press in new bush and new oil seal. It will be necessary to dress back the peening that holds the large thrust washer in place, and to replace the thrust washer (with a new one if worn) and peen in a different location to secure.

(5) If all parts are satisfactory regrease pivot bolt, lever arm and cams, then reassemble leaving pivot bolt nut finger tight.

Pinion

Check for damage or wear to teeth of pinion and to the rest of the unit. Replace if there is a fault.

MOTOR RE-ASSEMBLY

(1) Re-assemble the armature assembly, making sure to always fit a new snap ring.
Note: Remember to fit the fibre washer between the armature and shift housing.

(2) Locate the field ring assembly onto the shift housing, making sure that the locating pin lines up with the hole on the shift housing. Tap down square with a rubber mallet.

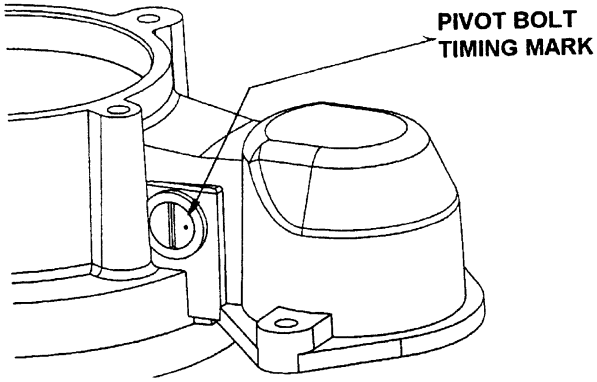
(3) Lower the brushes onto the commutator and fit the fibre washer onto bearing journal of armature. Ensure that the brush springs are in the middle of the outside face of the brush and not trapping the brush leads.

(4) Replace negative bolt into the commutator end and place onto the bearing journal of armature. Place through bolts through the commutator end housing and carefully through the brush assembly, making sure the brush leads are free. Then screw into the shift housing until finger tight.Tap down the commutator end housing with a rubber mallet and tighten through bolts to the required torque (see data). Refit the washers and nut to the negative terminal, after pushing the 'O' ring over the bolt.
Turn the motor by hand to see if it is free, and if so connect the power supply to the terminals. Switch on the power supply and rise in steps of 2 volts upto 24 volts. Then check that the current is less than 50 amps.
If the motor has a current less than 50 amps proceed. If not strip down, locate fault, rectify re-build and re-test.

(5) Locate solenoid into lever arm inside shift housing and tighten up bolts to the required torque (see data). Re-connect jumper and negative lead. Then test that the solenoid activates and pulls the pinion out to the pinion stop, by connecting 24 volts d.c. to the negative stud and terminal 1 on the switch.

TIMING/ABUTMENT SETTING

(1) Set the pivot bolt timing mark as shown in the diagram below:



(2) Activate the solenoid by connecting 24- volts to the negative stud and 24+ volts to the terminal 1 switch.

(3) With gauge CEG 14/108 place 3.1mm end into gap between pinion and pinion stop and set the gap to 3.1mm by turning the pivot bolt anti-clockwise. Remove the gauge and check that the drive moves into contact with the pinion stop. De-activate the solenoid.

(4) Activate the solenoid with gauge CEG14/108. Place the 1.2mm end into the gap between pinion and

pinion stop **(See Fig. 3)** and set the gap to 1.2mm by turning the pivot bolt anti-clockwise. Apply loctite/ thread lock to thread on pivot bolt and then torque up to the required setting (see data). Then De-activate the solenoid.

(5) If timing/abutment settings are correct, replace the nose housing in the correct position and torque the bolts to the required setting (see data). Then test on the bench test machine to ensure that the motor operates correctly.

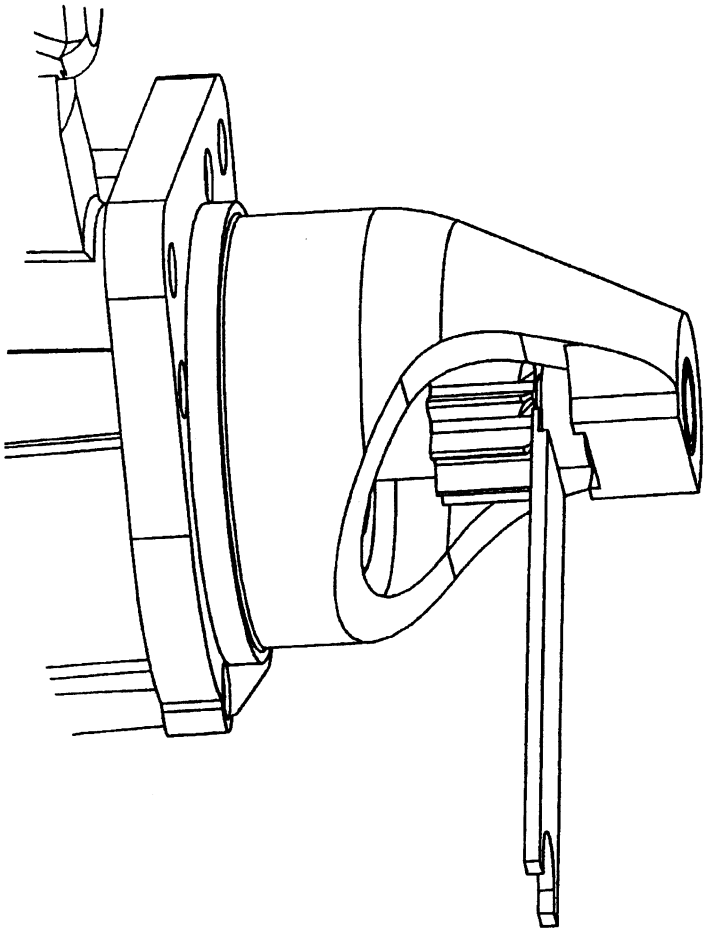
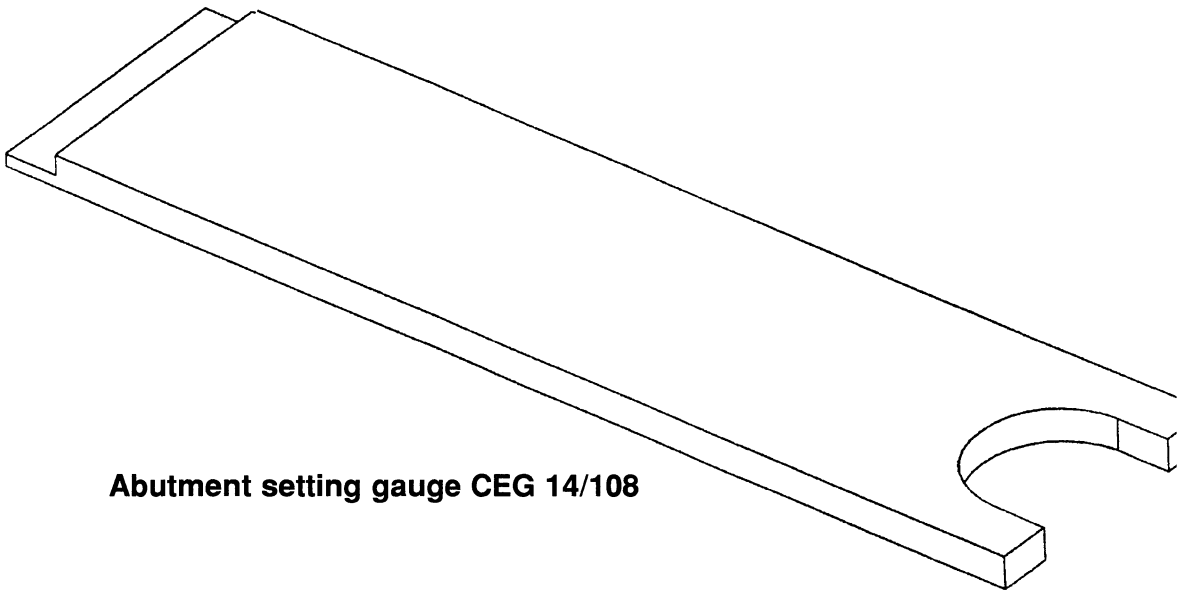
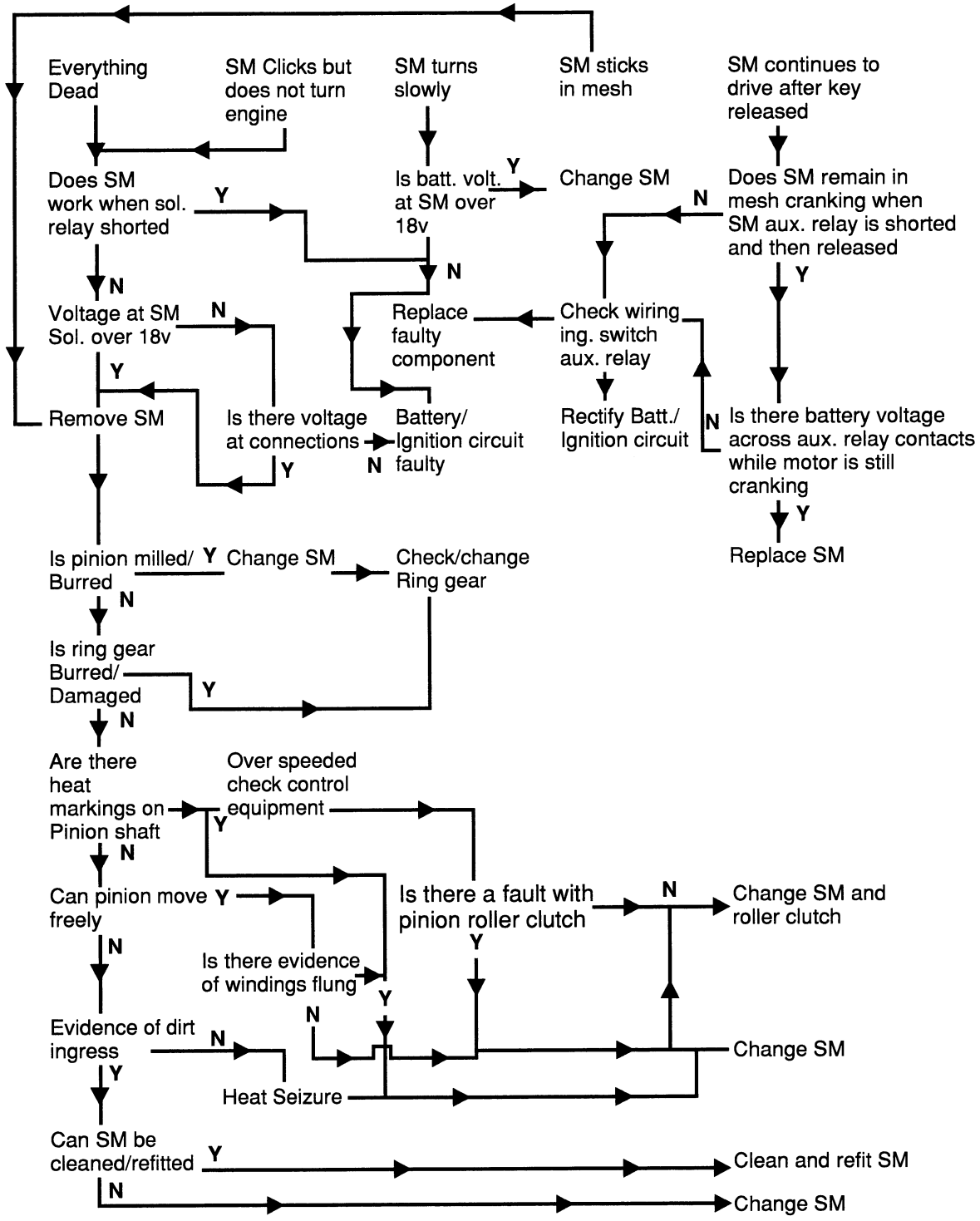


Fig. 3



Abutment setting gauge CEG 14/108



Y = YES
N = NO
SM = Starter motor