NIPPONDENSO DIRECT DRIVE

Courier
Pickup
Honda
Civic (Calif.)
Subaru
1600
1800
Toyota
Celica
Corona
Land Cruiser
Pickup
Tercel

DESCRIPTION

Nippondenso direct drive starter is conventional 12 volt, 4-pole, brush type starter. Integral solenoid is attached to drive housing and causes starter pinion to engage flywheel ring gear when starter is energized. Overrunning clutch pinion drive is mounted directly on drive end of armature shaft.

APPLICATION

Model	①Part No.
Courier	
2000 cc	D97Z 11002A
2300 cc	
Man. Trans.	D77Z 11002A
Auto. Trans.	D77Z 11002B
Honda	
Civic (Calif.)	31200 PAO 000
Subaru	
Man. Trans.	8299 18600
Auto. Trans. (Calif.)	4299 17200
Toyota	
Celica, Corona & Pickup	28100 34070
Land Cruiser	28100 60042
Cressida	28100 42021
Tercel	28100 15020

① – Vehicle manufacturer part number.

TESTING

PERFORMANCE TESTS

No Load Test – With starter on bench and using a fully charged 12 volt battery, make connections as shown in *Fig. 1*. Starter should rotate smoothly at specified RPM and current draw indicated in *Starter Performance Specifications*.

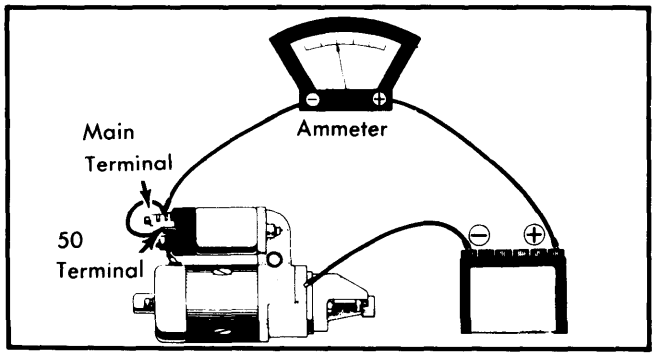

Fig. 1 Circuit for No Load Test

Lock Test – To perform lock test, follow procedures outlined in tester instruction manual. With starter locked in test stand and voltage adjusted as specified, ammeter and torque should be within limits.

SOLENOID TESTS

NOTE – *Tests must be performed with starter assembled and "M" (field) lead from starter disconnected at the solenoid. Plunger and sleeve must be clean and dry.*

Pull-In Test – Apply 8 volts momentarily between the "S" terminal and "M" terminal of solenoid. If plunger is pulled in strongly, pull-in coil is satisfactory.

Hold-In Test – Connect leads from an 8 volt source to solenoid case and "M" terminal. Connect a jumper wire between "M" terminal and "S" terminal to pull in plunger. Disconnect jumper wire from "M" terminal and plunger should remain held in. If plunger does NOT stay in, hold-in coil is defective and solenoid must be replaced.

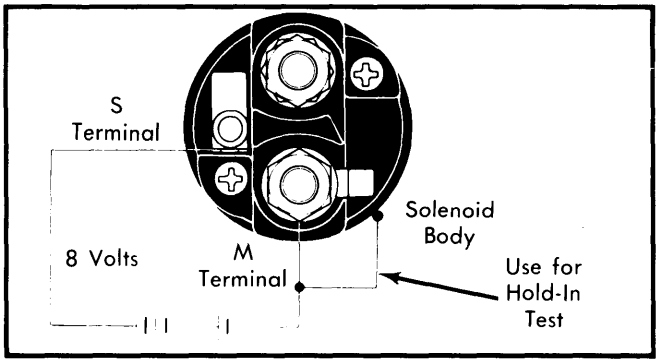

Fig. 2 Test Connections for Pull-In and Hold-In Coils

Plunger Return Test – Apply 12 volts between "M" terminal and solenoid case. Pull out starter pinion gear with fingers until it stops. If plunger returns to original position when pinion is released, solenoid is satisfactory.

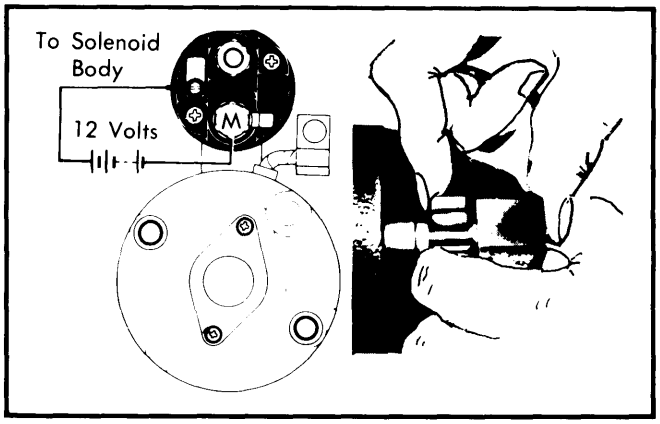

Fig. 3 Test Connections for Plunger Return

OVERHAUL

DISASSEMBLY

1) Disconnect field coil wire from starter solenoid main terminal and remove solenoid attaching bolts. Remove solenoid by moving it up and down to unhook unit from drive lever.

2) Remove bearing cover and pull out armature shaft lock plate, washer, seal and spring. Remove through bolts, commutator end frame, brush holder and yoke.

NIPPONDENSO DIRECT DRIVE (Cont.)

3) Remove drive lever set bolt, rubber piece, plate, armature and drive lever from housing. Remove pinion stop collar from armature shaft end and remove starter clutch.

PARTS REPLACEMENT & TESTING

Armature – Check armature for open, shorted or grounded circuits. Check armature shaft for bend. Inspect bushings for condition and maximum clearance of .008"(.20 mm). Replace if required.

NOTE – *Do NOT attempt to straighten a bent armature shaft. Replace if bent.*

Commutator – Clean contact surface and polish with fine sandpaper if required. If surface is scored, burned, out-of-round or pitted, dress in a lathe only enough to restore smooth concentric surface. Out-of-round should not exceed .004" (.10 mm) and mica depth should be .008-.032" (.20-.80 mm). Undercut to give correct depth of .020-.032" (.50-.80 mm).

Brushes & Springs – 1) Check brush holder insulation. Connect one lead of ammeter to brush holder positive side and other lead to negative side. If test needle moves, brush holder is shorted and must be replaced.

2) Check brush length and if less than .51" (13 mm) for Land Cruiser, .47" (12 mm) for Cressida, or .39" (10 mm) for all others, replace brushes. Check minimum spring tension of 21 ozs. (595 g) with brush installed. New brush springs should have 37-48 ozs. (1050-1360 g) tension. Brushes must move freely in holders.

Starter Solenoid – Test pull-in motion of solenoid by connecting test leads to the "50" terminal and the main "F" terminal. Plunger should be pulled in. If plunger does not pull in, switch is defective. Disconnect "F" terminal lead and plunger should remain pulled in if switch is satisfactory. Test plunger return movement by connecting battery positive lead to "F" terminal and negative lead to switch body. Depress plunger by hand, then release it. Switch is satisfactory if plunger returns to original position.

Field Coils – Connect one prod of circuit tester lead to field coil and other to soldered portion of brush lead. If meter does not register, field coil is open and must be repaired or replaced. Check field coil for ground by connecting one test prod to field coil lead and other to starter housing. If meter registers, coil is grounded and must be repaired or replaced.

REASSEMBLY

Clean all parts and coat sliding surface of armature shaft splines, starter clutch bushing, drive lever and moving stud with multipurpose grease. Reassemble in reverse order of disassembly and note the following: After completing reassembly, between pinion gear and stop collar. If clearance is not .080-.160" (.20-.40 mm) for Courier or .004-.160" (.10-4.0 mm) for all other models, adjust by lengthening or shortening plunger shaft.

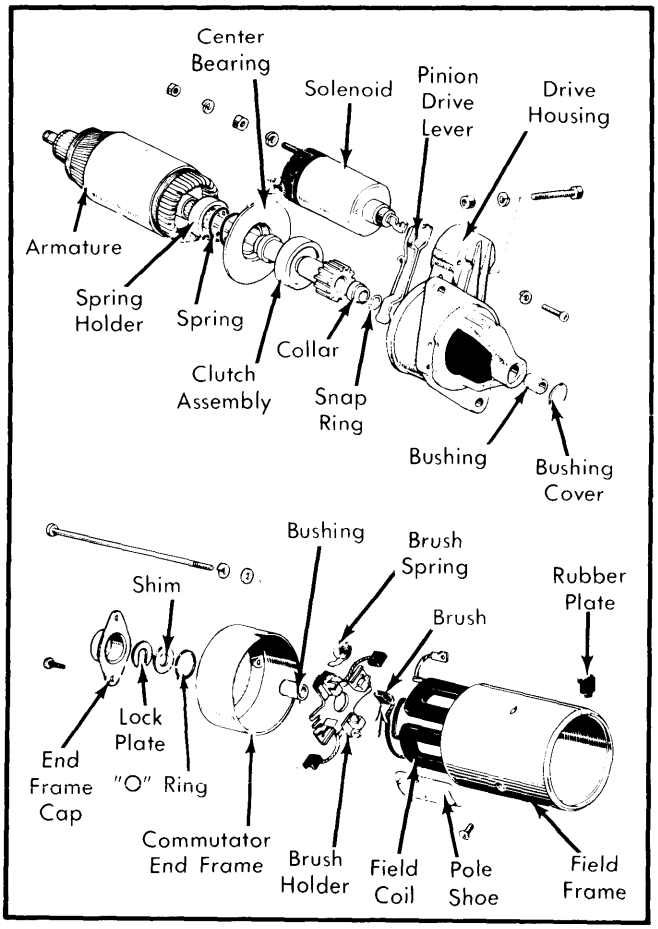

Fig. 4 Disassembled View of Typical Nippondenso Direct Drive Starter Motor

STARTER PERFORMANCE SPECIFICATIONS

Part No.	No Load Test		Lock Test		
	Amps.	RPM	Amps.	Volts	Torque (Ft. Lbs.)
D77Z, D97Z (All)	50	5000	.....	.....	.....
31200 PAO 000	50	5000	200	11	3.3
8299 18600	50	5000	600	7.7	9.0
4299 17200	50	5000	600	7.0	13.0
28100 (All)	50	5000	.....	.....	.....