NIPPONDENSO DIRECT DRIVE

Courier
Honda
Civic & Calif. Civic CVCC
Subaru
Toyota

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	① Part No.
Courier	D77Z
Honda Civic	
Calif.	65274 31200 657 025
Federal	59840 31200 657 671
Subaru	
Man. Trans.	028000 2970
Auto. Trans.	028000 6540
Toyota	
2F Engine	28100 60041, 60042
3K Engine	28100 24080
4M Engine	28100 42020, 42021, 45033
20R Engine	
Federal	28100 34070
Calif.	28100 33020

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*.

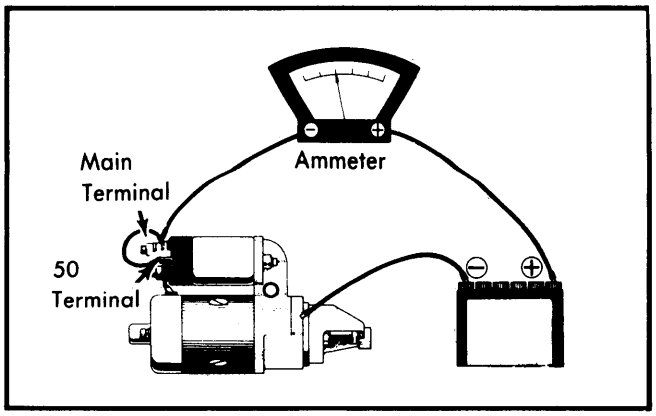

Fig. 1 Circuit for No Load Test

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.

STARTER PERFORMANCE SPECIFICATIONS

Part No.	No Load Test		Lock Test		
	Amps. (Maximum)	RPM (Minimum)	Amps. (Maximum)	Volts	Torque (Minimum)
D77Z	50	5000	.....	.....	.....
657 025	70	6000	380	5.5	6.15
657 671	70	6000	380	5.5	6.15
2970	50	5000	600	7.7	9.0
6540	50	5000	600	7.0	13.0
24080	55	3500	450	8.5	9.4
33020	50	5000	.....	.....	.....
34070	50	5000	.....	.....	.....
42020	50	5000	.....	.....	.....
42021	50	5000	.....	.....	.....
45033	50	5000	.....	.....	.....
60041	50	5000	.....	.....	.....
60042	50	5000	.....	.....	.....

NIPPONDENSO DIRECT DRIVE (Cont.)

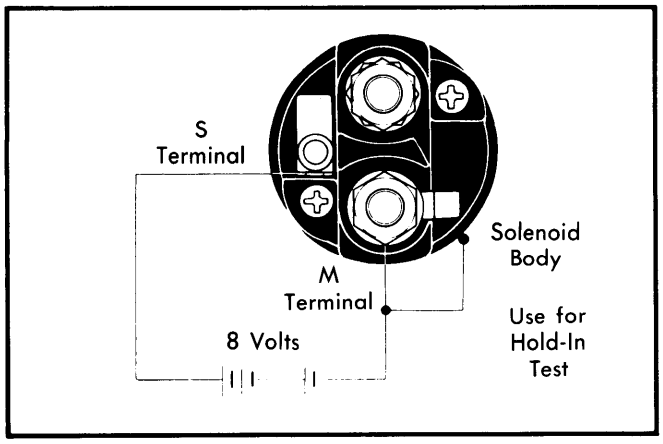

Fig. 2 Test Connections for Pull-In and Hold-In Coils

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.

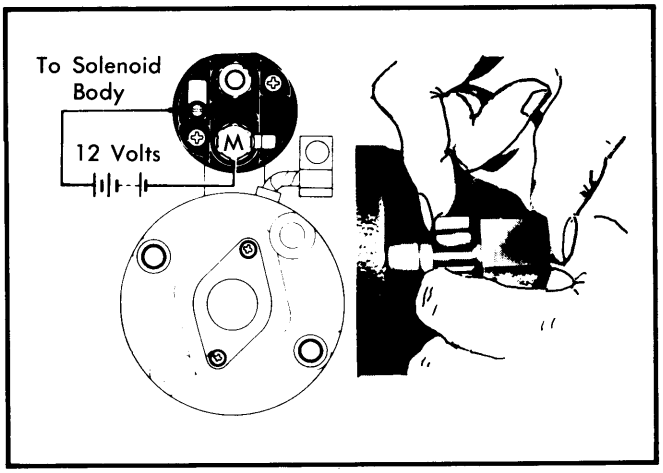

Fig. 3 Test Connections for Plunger Return

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.

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 .16" (4 mm) for Honda, .39" (10 mm) for Toyota 3K, .51" (13 mm) for Toyota 2F, or .47" (12 mm) for all others, replace brushes. Check minimum spring tension of 21 ozs. (595 g). 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, operate starter under no-load condition and check clearance between pinion gear and stop collar. If clearance is not to specifications, adjust by lengthening or shortening plunger shaft.

Pinion Gear Clearance

Application	Clearance
Ford Courier	.080-.160" (.20-.40 mm)
Honda	.012-.059" (.03-.15 mm)
Subaru	.004-.160" (.01-.40 mm)
Toyota	.040-.160" (.10-.40 mm)

NIPPONDENSO DIRECT DRIVE (Cont.)

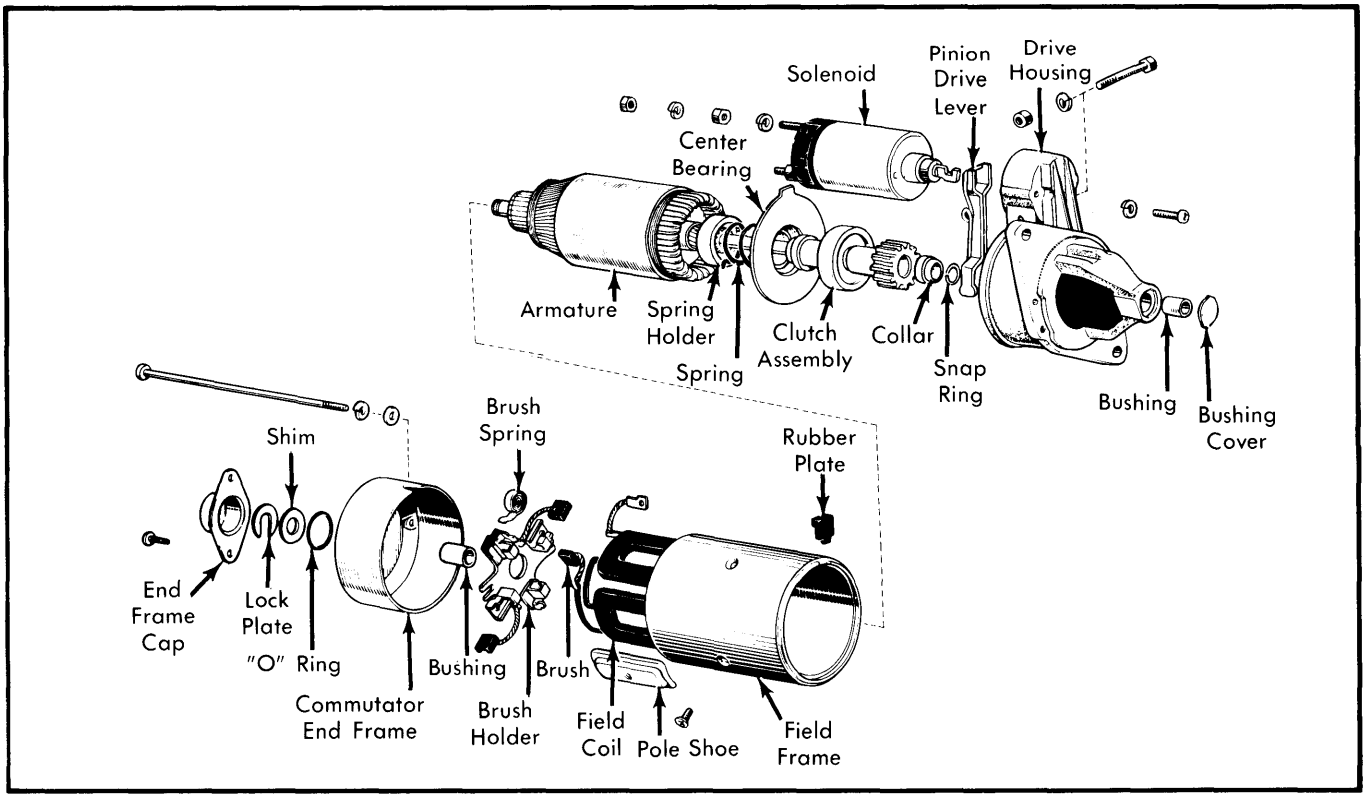

Fig. 4 Disassembled View of Nippondenso Direct Drive Starter Motor