NIPPONDENSO

Ford Courier (1972-73)
Subaru (1971-73)
Toyota (1965-73)

DESCRIPTION

The Nippondenso starter has four pole pieces and four sets of field coils. Four commutator brushes are installed; two are grounded, and two are insulated and are connected to the ends of field coils. Field coil is connected with armature coil through brushes and commutator segments in series. Starter clutch is engaged to armature shaft with helical splines. The turning of the pinion is due to these helical splines which result in a smooth engagement of pinion and flywheel.

APPLICATION

Model	Part No.
Ford Courier ①	
1972	D27Z-11002-A
1973	D37Z-11002-A
Subaru ②	
1971-72	28000-297-0
1973	28000-296-0
Toyota ③	
KC Engines	
1969-70	22011, 22020
2TC Engines	
1971-72	25012, 25021
1973	25021
3KC Engines	
1971-72	22012,22021
1973	12030
8RC Engines	
1969-71	33020, 40041
3RB Engines	
1965-67	40010, 40020 40040, 40041
3RC Engines	
1968-70	40041
18RC Engines	
1972	33020, 40061
1973	40041
M Engines	
1965-67	42010, 42020
2M Engines	
1968-71	42010, 42020
4M Engines	
1971	42010,42020
1972	42020
1973	45021
F Engines	
1965-72	60041
1973	60060

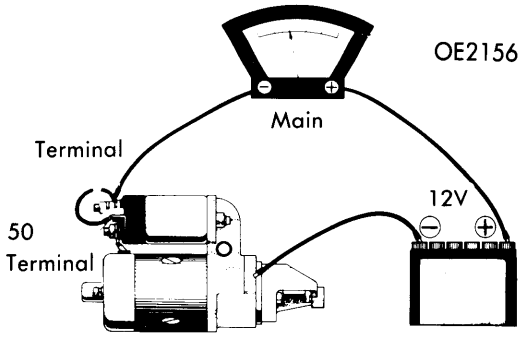
① — Ford part numbers.
② — Nippendenso part numbers.
③ — Toyota part numbers using prefix 28100.

TESTING

PERFORMANCE TESTS

No Load Test — With starter on bench, and using a fully charged 12-volt battery, make connections as shown. The starter should rotate smoothly. See specification chart for RPM, voltage, and current draw.

Lock Test — To perform lock test follow instructions and procedures outlined in instruction manual furnished with tester. With starter locked in test stand, and voltage adjusted to specified figure, ammeter reading and starter torque should be within limits (see specifications).



NO LOAD TEST

OVERHAUL

DISASSEMBLY

1) Disconnect field coil wire from starter solenoid main terminal and remove the two 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.

3) Remove through bolts, commutator end frame, brush holder and yoke.

4) Remove drive lever set bolt, rubber piece, plate, armature and drive lever from housing.

5) Remove pinion stop collar from armature shaft end, and remove starter clutch.

PARTS REPLACEMENT & TESTING

Armature — Check armature for open, shorted or grounded circuits. Inspect armature shaft for bend; if bend is excessive replace armature. *NOTE — Do not attempt to straighten a bent shaft.* Inspect armature shaft to bushing clearance. If clearance exceeds .008", replace bushing.

Commutator — If condition warrants, carefully polish commutator with a strip of fine glass paper. If surface is scored, rough or burnt, dress with lathe just enough to remove defective area. If out-of-round exceeds .012", commutator must be turned. After turning, out-of-round must not exceed .004". Check mica depth and file off mica if depth is less than .008". Correct depth is .020-.032".

Brushes & Springs — 1) Check brush holder insulation. Connect one lead of ammeter to brush holder positive side and other lead to negative side of brush holder. If tester needle moves, the brush holder is shorted due to defective insulator. Replace brush holder.

2) Check brush length and if less than .47" replace brushes. Be sure brushes move freely in holders and if movement is sluggish, clean brushes and holders.

NIPPONDENSO (Cont.)

3) Check brush spring tension and if less than 21 ozs. replace springs. New brush springs should have a tension of 37-48 ozs.

Field Coils – Check field coils for open circuit using a circuit tester. Connect one test prod to field coil lead and the other prod to soldered portion of brush lead. If meter does not register, field coil is open. Repair or replace as necessary. Check field for ground by connecting one test prod to field coil and other lead to starter housing. If meter registers, coil is grounded. Remove field coil and repair or replace as necessary.

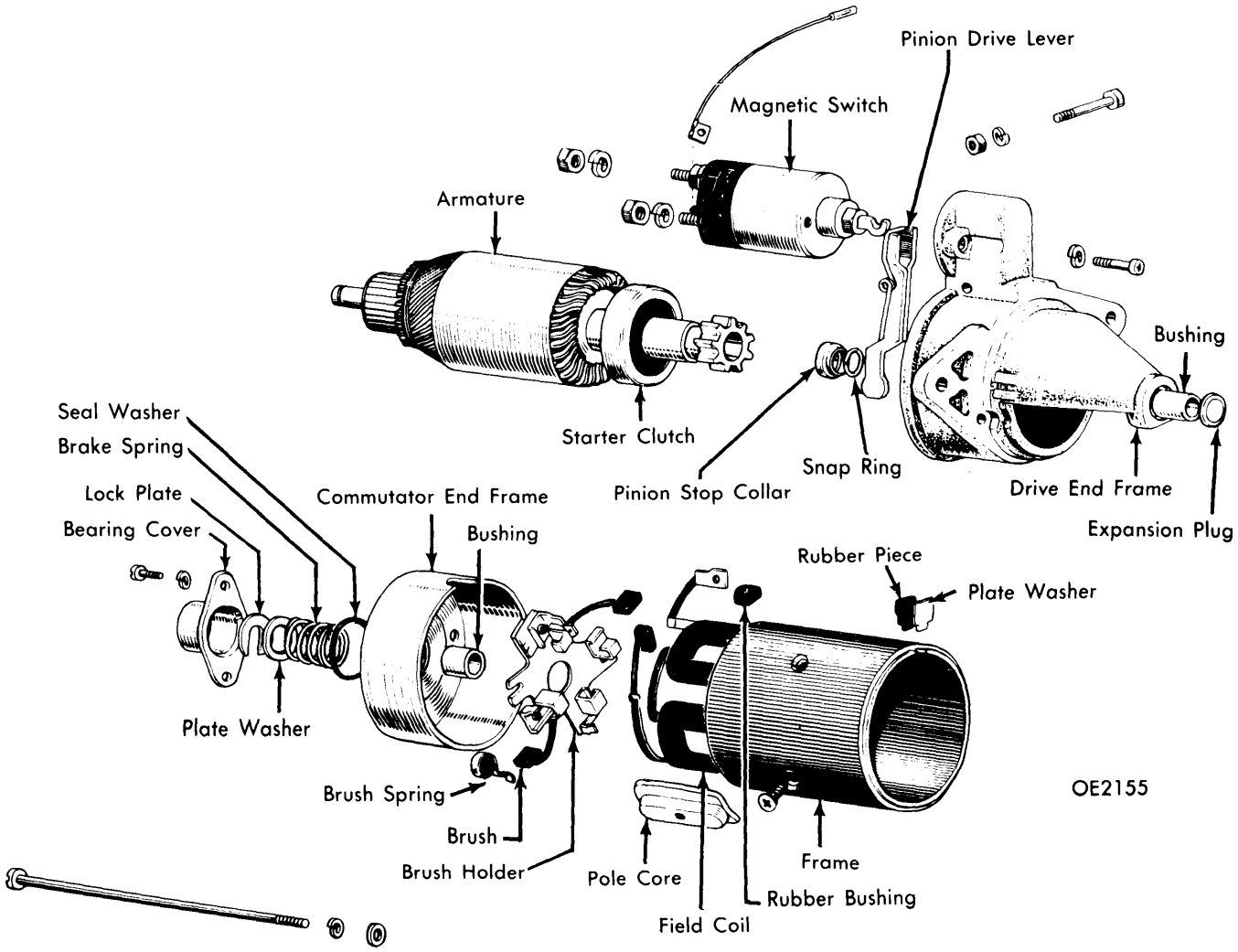
Starter Solenoid – Test pull-in motion of solenoid by connecting test leads to the "50" terminal and the main "F" terminal. Apply 8 volts. Plunger should be pulled in. If switch does not pull in, it is defective. Disconnect the "F" terminal lead only. If plunger remains pulled in, then switch is satisfactory. Test plunger returning movement by connecting the battery positive lead to the "F" terminal and the negative lead to the switch body. Depress plunger by hand and release it. If plunger returns to its original position with 12 volts, switch is satisfactory.

REASSEMBLY

Clean all parts and coat the sliding surface of armature shaft splines, starter clutch bushing, drive lever and moving stud with multipurpose grease. Reassemble in the reverse order of disassembly while noting the following: After completing reassembly, operate starter under a no load condition and check clearance between pinion gear and pinion stop collar. If clearance is not within specifications, adjust length of solenoid plunger shaft. Standard length of shaft is 1.34". To increase clearance, lengthen plunger. To decrease clearance, shorten plunger length.

Pinion Gear Clearance

Application	Clearance
Courier	
1972-73	.08-.16"
Subaru	
1971-73	.04-.20"
Toyota	
1965-73 F & 3KC	.04-.12"
1971-73 2TC, 18RC & 4M	.04-.16"
All Others	



STARTER BREAKDOWN (TYPICAL)

NIPPONDENSO (Cont.)

STARTER PERFORMANCE SPECIFICATIONS					
Model	No Load Test		Lock Test		
	Amps.	RPM	Amps.	Volts	Torque
D27Z-11002-A	below 50	5000	.....	.....	.....
D37Z-11002-A	below 50	5000	.....	.....	.....
2800-296-0	below 50	5000	below 470	7.7	over 9.4 ft. lbs.
2800-297-0	below 50	5000	below 470	7.7	over 9.4 ft. lbs.
28100 12030	below 55	3500	below 100	8.5	over 5.8 ft. lbs.
28100 22011	below 55	3500	below 458	8.0	over 8.0 ft. lbs.
28100 22012	below 55	3500	below 100	8.5	over 5.8 ft. lbs.
28100 22020	below 55	3500	below 458	8.0	over 8.0 ft. lbs.
28100 22021	below 55	3500	below 100	8.5	over 5.8 ft. lbs.
28100 25012	below 50	5000	below 470	7.7	over 7.1 ft. lbs.
28100 25021	below 50	5000	below 470	7.7	over 7.1 ft. lbs.
28100 33020	below 45	6000	below 550	7.7	over 10.0 ft. lbs.
28100 40010	below 50	3000	below 380	7.7	over 7.7 ft. lbs.
28100 40020	below 50	3000	below 380	7.7	over 7.7 ft. lbs.
28100 40040	below 50	3000	below 380	7.7	over 7.7 ft. lbs.
28100 40041	below 45	6000	below 550	7.7	over 10.0 ft. lbs.
28100 40061	below 45	6000	below 550	7.7	over 10.0 ft. lbs.
28100 42010	below 45	6000	below 550	7.0	over 10.0 ft. lbs.
28100 42020	below 50	5000	below 500	7.0	over 13.0 ft. lbs.
28100 45021	below 45	6000	below 550	7.0	over 10.0 ft. lbs.
28100 60041	below 45	3500	below 430	7.3	over 10.5 ft. lbs.
28100 60060	below 45	3500	below 430	7.3	over 10.5 ft. lbs.