Starters

NIPPONDENSO REDUCTION GEAR

Honda Accord, Civic, Prelude; Subaru (1800 cc Only); Toyota Celica, Corolla, Cressida, Pickup, Supra

DESCRIPTION

The starter is a 12-volt, 4-brush, solenoid-actuated, gear reduction type motor, equipped with an overrunning clutch. The brush holder assembly retains brushes and springs in the starter housing.

The starters may having varying kilowatt ratings, however, testing and service procedures are similar for all models.

NOTE: Brushes and commutator may be on gear end or end away from reduction gear.

APPLICATION

Model	[1] Part No.
Honda	
Accord & Prelude	
Calif.	31200 PC2 671
Others	31200 PC2 661
Civic	
Federal & Hi. Alt.	31200 PC2 004
Subaru	
1800 cc	
Man. Trans.	[2] 42991 7220
Auto. Trans. (Calif.)	[2] 42991 7310
Toyota	
Celica	28100 34053, 28100 34080
Corona	28100 34080
Corolla	28100 27050
Cressida	28100 41060
Pickup (Gas)	28100 34080
Pickup (Diesel)	28100 54090
Supra	28100 41060, 28100 45033

[1] — Vehicle manufacturer's part number.
[2] — Nippondenso model number is 028000-7600 for Man. Trans.; 028000-6550 for Auto. Trans.

TESTING

PERFORMANCE TESTS

No Load Test (All Models)

1) Connect ammeter in series with starter motor and 12-volt battery as shown in *Fig. 1*. Connect voltmeter in parallel with battery and observe readings.

2) Starter should spin smoothly at 3000 RPM or more with current draw below 90 amps. (180 amps. on diesel engines) at 11.5 volts.

Load Test (Subaru)

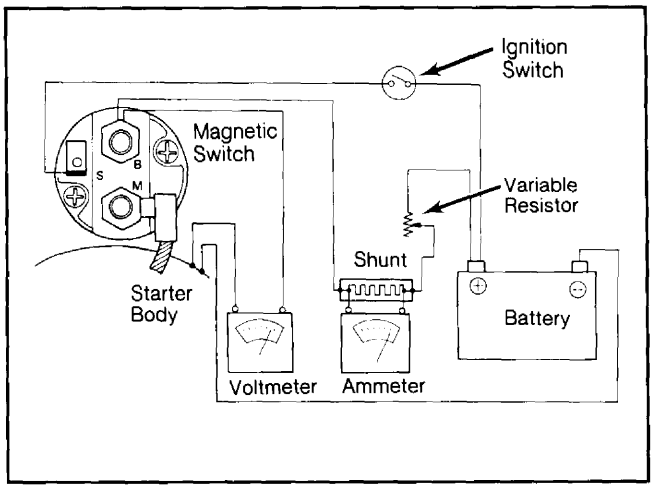
1) On manual transmission models, apply 4.7 ft. lbs. (6.2 N.m) torque to starter. With voltage adjusted to 8.5 volts, starter should rotate at 1180 RPM with current draw below 230 amps.

2) On automatic transmission models, apply 9.4 ft. lbs. (12.5 N.m) torque to starter. With voltage adjusted to 9 volts, starter should rotate at 1000 RPM with current draw below 350 amps.

Lock Test (Subaru)

1) On manual transmission models, adjust voltage to 2.5 volts. With starter stalled or not rotating, torque should measure 5 ft. lbs. (6.5 N.m) with current draw below 300 amps.

Fig. 1: Ammeter and Voltmeter Hook-Up for No Load Test



Subaru starter is illustrated.

2) On automatic transmission models, adjust voltage to 2.4 volts. With starter stalled or not rotating, torque should measure 8 ft. lbs. (10.6 N.m) with current draw below 400 amps.

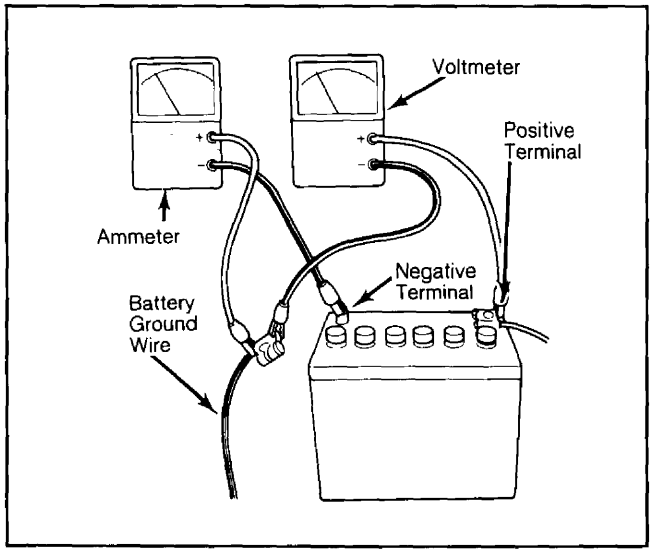
Cranking Test (Honda)

1) Hook up voltmeter and ammeter as shown in *Fig. 2*. Disconnect ignition coil secondary wire from distributor and ground it. Turn ignition switch to start.

2) Check cranking voltage and current draw. Voltage should be no less than 8.0 volts for Civic, 9.6 volts for Accord and Prelude.

3) Current draw should be below 230 amps. for Federal and High Altitude Civics and 160 amps. for Accord and Prelude. Cranking speed should be approximately 300 RPM.

Fig. 2: Meter Hookup for Honda Cranking Test



Be sure voltmeter and ammeter connections are correct.

NIPPONDENSO REDUCTION GEAR (Cont.)

OVERHAUL

DISASSEMBLY

1) With starter removed from vehicle, disconnect wire(s) to magnetic switch. Remove bolts and remove field frame with armature from magnetic switch. Remove "O" ring and felt seal.

2) Remove screws and then remove starter gear housing from magnetic switch. Pull out clutch assembly and gears. Remove ball from clutch shaft hole or from magnetic switch. Remove brushes from brush holder then pull armature out of field frame.

3) Use low pressure air and soft bristle brush to clean brush dust from field frame assembly and armature. Use care to prevent dust from contaminating front and rear bearings or it may be necessary to replace them.

NOTE: Complete immersion of starter and/or components in solvent is not recommended.

PARTS REPLACEMENT & TESTING

Brushes & Springs

1) If brush length is less than .33" (8.5 mm) on Accord, Prelude and Subaru (auto. trans.); .35" (9 mm) on Subaru (man. trans.); .47" (12 mm) on Toyota diesel engines; or .39" (10 mm) on all other models, replace brushes. Replace brush springs if weakened.

2) Check condition of brush holders, spring clip and insulation between positive and negative holders and repair or replace as needed.

Commutator

1) Inspect commutator for roughness. If surface is pitted, stepped or grooved, it should be lightly sanded with No. 400 sandpaper. Check commutator for out-of-round.

2) If out-of-round is more than .002" (.05 mm) on Toyota, or .001" (.03 mm) on Honda, turn commutator on lathe until out-of-round is within specification. On Subaru models, outer diameter of commutator should be 1.18" (30 mm). Wear limit is 1.14" (29 mm).

3) If worn to less than .008" (.20 mm), insulating mica should be undercut to a depth of approximately .028-.035" (.71-.89 mm) on Toyota diesel models, and .015-.031" (.40-.80 mm) on all other models..

4) Wear or cutting limit of commutator is 1.22" (31 mm) for Cressida and Supra, 1.26" (26 mm) for Civic, and 1.14" (29 mm) for all others.

Armature Coil

1) Check commutator and armature coil core for continuity, if continuity exists, replace armature. Check armature with an armature tester (growler) for shorts. If shorts exist, replace armature.

2) Check for continuity between segments on commutator. If no continuity exists, replace armature.

Field Coil

Check field coil for open circuits. There should be continuity between lead wire and field coil brush lead. If not, replace field coil. Check for no continuity between field coil end and end frame. If continuity exists, replace field coil.

Overrunning Clutch Assembly

Inspect gear teeth for wear and damage. Replace gears if damaged. Also, if gears are damaged, check flywheel ring gear. Rotate pinion. Pinion should rotate freely in a clockwise direction and lock up in a counterclockwise direction.

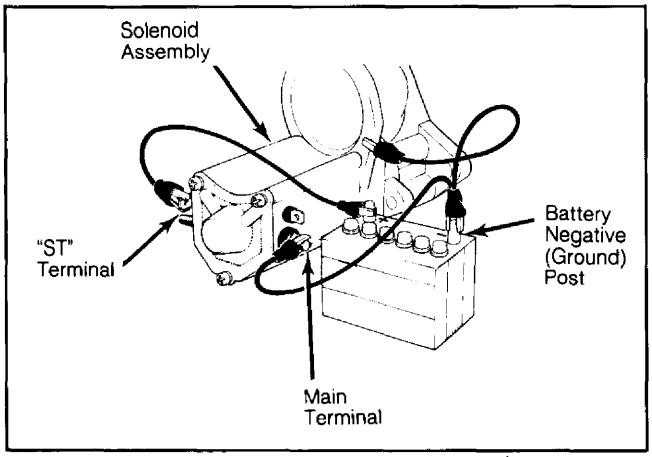
Bearings

Turn each bearing by hand. Replace bearings if they stick or have a high resistance to turning.

Solenoid Pull-In Coil Test

Connect 2 battery negative leads to main terminal ("C" terminal on Subaru) and ground. Connect a 12-volt battery positive lead to solenoid "ST" terminal (terminal "50" on Subaru). *See Fig. 3.* Plunger should extend firmly. If not, replace solenoid.

Fig. 3: Solenoid Pull-In Coil Test

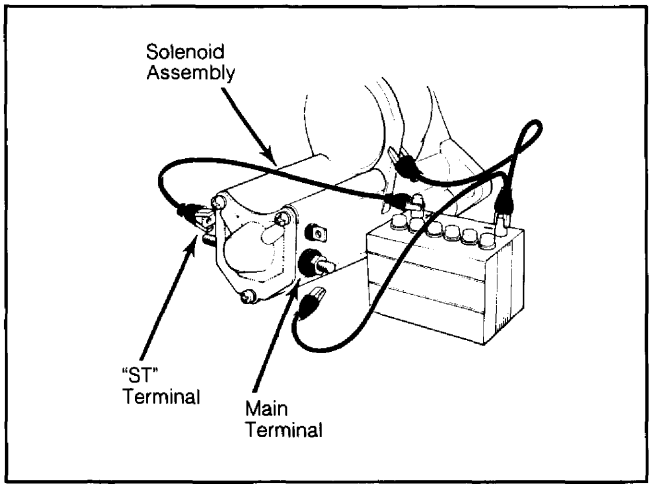


Connect battery positive to "ST" terminal (terminal "50" on Subaru).

Solenoid Hold-In Coil Test

After pull-in testing, disconnect battery negative lead from main terminal ("C" terminal on Subaru). Plunger should remain extended. If not, replace solenoid. *See Fig. 4.*

Fig. 4: Solenoid Hold-In Coil Test



Disconnect negative lead from main or "C" terminal.

REASSEMBLY

To reassemble, reverse disassembly procedures and note the following: Coat all sliding or moving surfaces of shaft splines, bushings and solenoid with multi-purpose grease. Apply grease to clutch assembly cavity to retain steel ball when assembling.

NIPPONDENSO REDUCTION GEAR (Cont.)

Fig. 5: Exploded View of Nippondenso Reduction Gear Starter